

# COMPUTER WORLD

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NEWSPAPER

NEWS  
IN  
BRIEF

### SS Number Becomes Banking ID Number

WASHINGTON, D.C. — The government has found a new use for the Social Security number. As of July 1, it also became an individual's Taxpayer Identification (TID) number, and all banks are required to use it, to facilitate retrieval of records.

Corporations have separate TID numbers, government sources reported, but for individuals, it is the SS number.

Filing of income tax information by using the SS number is not new, but now banks must use this system in case the Treasury Department needs financial records for investigating organized crime, sources said last week.

The disclosure of the new requirement came during a *Computerworld* investigation of regulations which implement the so-called Bank Secrecy Act of 1970. This act, designed to reduce tax evasion through Swiss bank accounts and to help fight organized crime, requires banks to microfilm, for government access, every check, draft or money order, in addition to other documents.

### GE Ready to Donate 10 CPUs

#### Damaged in New York Flood

ELMIRA, N.Y. — GE is trying to determine whether schools or other educational institutions would be interested in using 265 CPUs that were damaged in this area during the recent floods.

According to a GE Information Services Division spokesman, "we are trying to find out if the schools could make some use of the damaged systems. We would donate them to the schools if we find a need."

But at the same time, he also noted that the firm was exploring "commercial" avenues for the disposal of the systems.

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## 1973 Meeting in New York

# Afips Moves to One National Show

By Edward J. Bride  
Of the CW Staff

MONTVALE, N.J. — The Fall Joint Computer Conference will be the last Joint Computer Conference.

A new, single National Computer Conference (NCC) and Exposition, lasting five days, is being planned for New York City next year, according to Walter Anderson, president of the American Federation of Information Processing Societies (Aflips).

The NCC, which will supersede the spring and fall joint conferences (which had been planned for Philadelphia and San Francisco respectively) will be held June 4-8, 1973, in the New York Coliseum, Aflips said.

While other groups have been disappointed with attendance at New York conferences in recent months, Manhattan was the recommendation of the Aflips Industry Advisory Panel, a spokesman said. The Coliseum has been called the

most expensive hall in the country, both because of floor space and the requirement to deal with as many as a dozen unions in setting up a conference.

The expenses, however, should be diminished by a larger number of exhibitors, Aflips indicated.

Plans are proceeding for the 1972 Fall Joint Computer Conference, Dec. 5-7, in Anaheim, Calif. While this will be the last of the separate conferences, it will actually be a phase-in to the new format, sources disclosed.

Of the 60 sessions planned, for example, about half will be user-oriented, consisting of panels and management seminars. Additionally, there will be four full-day user programs in parallel, specifically aimed at the banking, manufacturing and health industries, and "information data centers."

(Continued on Page 2)

## Kiewit Official Urges

# 'Crash Now, Not Later'

By Ronald A. Frank  
Of the CW Staff

HANOVER, N.H. — The user should allow his telecommunications system to crash whenever "serious software inconsistencies" are discovered.

"Rather than attempt a software error recovery procedure, the user should crash now, not later," according to Robert Hargrave, associate director of the Kiewit Computer Center at Dartmouth College.

Communications Seminar

Speaking at the annual data communications seminar sponsored by the center, Hargrave said consistency checks should be inserted into the system to determine

how long it continues to operate after an error has been committed.

When errors or crashes occur, an error-chain backtracking procedure should be followed to remove the last error first, he said. "You may never get another chance to duplicate the condition that exists in the system at that point."

In analyzing the cause of the crash the user should write out tables, registers, core memory contents or any other data that will help to diagnose the cause of the problem, he said.

One effective way to monitor system performance is to insert "statistics counters" at critical points, he suggested.

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## 256K Model 30 In First Use

By E. Drake Lundell Jr.

Of the CW Staff

SAN FRANCISCO — The first 360/30 with a core upgrade to 256K in operation here and the user is pleased with the initial results.

The 256K unit was installed in the San Francisco Data Center of Greyhound Computer Corp. by Computer Hardware Consultants & Services (CHCS) at the end of June.

Currently the largest standard Model 30 from IBM contains 64K.

In a test comparing the 256K 30 against a 256K 40 on a series of heavily CPU-bound complex, Greyhound found "the job took only 18 minutes with the 256K 30, as compared to 14.5 minutes on the 40," according to Larry Larsen, general manager of the center.

"On normal jobs that are more I/O bound, we want to do more benchmark studies, but feel certain we won't lose any time on the Model 30. The time constraints are on the printers and tapes which are identical for both models."

Use of the upgraded 30 will allow the service bureau to offer 360/40 users "substantial" savings on their DP costs, Larsen said. In addition to the 30 and 40, the firm also operates a 360/65 and a 7094.

"It's true," Larsen admitted, "that our Model 40 is faster, since it handles 2 bytes at a time with a cycle time of 2.5  $\mu$ sec compared to the Model 30's 1 byte at a time with a cycle time of 1.5  $\mu$ sec."

Larsen claimed that only experience would show what the full potential would be for the Model 30s, contending that "maybe 256K isn't the limit."

The 256K upgrade costs \$103,000 and a one-year lease will cost \$4,020/mo. Maintenance adds \$120/mo, according to CHCS at 1409 Easton Road, Warrington, Pa. 18976.



## Checkout System Checks In

Clerks check out customers at the new Atlanta Richway discount store. The store is the first in the nation to use "almost every facet" of the NCR 280 Retail System, according to the vendor.

Frank Dooley, assistant DP manager for Rich's, Inc., parent company of the discount chain, described the point-of-sale system as "the total works, from wand reading to tape."

The light pens eliminate manual keying-in of transaction data.

Despite Rich's own programming bugs on the company's IBM 370/145, Dooley said the point-of-sale side was doing "fine."

★ Special Report: Communications, User's Choice... Follows Page 18

# Afips Drops Joints, Switches to One National Show

(Continued from Page 1)

The Afips announcement called on all societies, whether members of the federation or not, user groups and industry-oriented associations to participate in a "National Computer Week."

## 'National Resource'

The computer week and the broader orientation of the new conference will help develop data processing as a "national resource," Afips said in announcing

the decision of the six-member JCC board.

The decision to change from two shows a year to a single conference was "not an accident," Anthony said, but was "mandatory" in light of the recession and the changing nature of computer use.

Over the last three years, the JCCs have been plagued with diminishing participation, by both attendees and exhibitors. A 1,000-hour limitation imposed two years ago was strictly academic as soon as

it was effective, with booth numbers steadily declining to around 300.

Attendance has dwindled from a high of around 30,000 one year ago to less than half at the last JCC.

To respond to the trends, Afips last year formed the Industry Advisory Panel (IAP), and the group of 10 industry representatives called for major changes in JCC format.

Initial changes made last spring included providing attendees lists to exhibitors, a service previously forbidden by Afips policy.

The IAP recommended switching to one national conference a year, to be combined with several regional meetings; that recommendation has been temporarily tabled, Afips indicated.

## Society Reaction

Reaction to the move to one single conference, and to New York as its location, was varied. While Afips claimed the exhibiting community and federation members had shown "extremely strong sentiment" for New York, the member societies were less enthusiastic.

The Computer Society of the Institute of Electrical and Electronics Engineers (IEEE/CS) said the impact on the agreement between IEEE and Afips might need "some study."

Dr. Al Hoagland, society president, said that "not obvious to me" that this was the correct route to take, and he had requested a special meeting with Afips so he could be briefed on the criteria used. While some observers have noted the

financial plight of some professional groups, Hoagland said IEEE/CS was in a "very healthy position," adding the JCCs were not his group's major source of income. There are about 17,000 members in the Computer Society, he noted.

## Cautious Reaction

ACM President Anthony Ralston said his reaction was "cautious... certainly

## Milestones

1961 - December. First "Joint Computer Conference" held in Philadelphia, with ACM and IEEE predecessors participating; 877 attendees, no exhibitors.

1962 - 1,110 attendees, 20 exhibitors.

1963 - February. First "semiannual" conference in Los Angeles, called the "Western Joint Computer Conference." Eastern JCC held in Washington, D.C., in December.

1964 - Named change to "Spring" and "Fall" joint conferences. Sponsoring organization changes its name from National Joint Computer Conference Committee to Afips.

1969 - May. Record 30,726 non-exhibiting personnel attend JCC in Boston. Because of size of hall, exhibitors limited in number to 172, with 427 booths. July. IEEE, ACM and SGI to make future JCCs a "joint venture." November. Las Vegas FJCC draws record 368 companies to two separate exhibit floors; 987 booth space exhibitors. Attendance drops to 18,600 non-exhibiting personnel.

1971 - November. FJCC attendance 12,243.

1972 - May. JCC attendance 11,867, with 290 exhibit booths. December. Last Joint Computer Conference.

not agreed." While the entire JCC board overruled that one national conference a year was preferred, he said other issues decided were not unanimous.

Ralston also said he and Hoagland would meet at the specially called meeting of Afips board on Aug. 11. He is "not entirely convinced" that every detail of the Afips announcement is final, he said.

John McLeod, founder and past president of Simulation Councils, Inc. (SCI), took a less serious view of the decision to reduce the national show to once a year. He was not pleased with New York, however, and added, "being a simulator, I think we should build a model" to see how the decision might affect Afips, attendees and other users.

## 'Unanimous' Decision

While Hoagland said he had not seen "substantial evidence" to support the action, and recalled that the Afips agreement called for participation in two conferences a year, Afips claimed the decision was unanimous.

The JCC board is comprised of representatives of IEEE/CS, ACM and SGI, plus three Afips representatives.

## Nutrition Data Bank Built

CHICAGO - Swift and Company has established a nutrition data bank containing detailed information on its food products for consumers and any other who may be interested.

Along with data on moisture, protein, fat, carbohydrate, vitamin and mineral content of its food products, the company's major food consumers products. The information has been compiled in the computerized data bank at the firm's research and development center.

## State Must Answer Complaints

By a C.W. Staff Writer

NEW YORK - A new state law requires this city's computerized Parking Violations Bureau (PVB) to answer complaints within 75 days or automatically drop charges against alleged violators.

The law stems from a long series of erroneous tickets, some of which went to motorists who never visited the city, local sources reported.

State legislators and the local press have blamed the computer for indexing errors, issuing tickets, but PVB officials say it is mostly an input problem.

Several typical causes of the errors were cited last week by a bureau spokesman:

- New York State has identical series of license tag numbers for different classes of vehicles, e.g., motorcycle, automobile.
- Policemen sometimes write the wrong state on traffic tickets, and neighboring states use the same numbers for tags.
- Traffic tickets might be written incorrectly by transposing license tag numbers.

## System Advantages

Even so, the anonymous DP employee cited some advantages of the bureau which removed essentially the handling of traffic summonses from the criminal courts:

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- The city has saved \$5,000 work-hours by eliminating the requirement for policemen to appear in court (the claimed appeals procedures satisfy most complaints).

- The city may collect as much as \$41 million in traffic fines this year.

- The system is being redesigned to avoid issuing unwarranted summonses, such as when FBI agents park illegally, or handicapped persons and those with special permits park in otherwise restricted areas.

In late in the week, an aide to PVB Director Anthony Atlas confirmed that the fault was not in the computer system, but in the plate numbering system. The computer problem might occur when key punchers misread traffic tickets, the aide added.

## Let System Crash, Users Told

(Continued from Page 1)

Among these would be a counter to keep track of "insignificant problems" such as errors of transmission errors in a data set. At predetermined levels the cause of any excessive indications on such occasions would be noted, and when they become major problems, Hargraves added.

## Network Optimization

In a session on network optimization the 40 attendees were told the monthly phone bill for a teleprocessing network is directly tied to the skill of the user in defining his needs.

"The user's operating characteristics dictate his network design," according to Dr. Paul Shannon, president of Digital Systems Corp. Shannon said a central "super center" has better operating characteristics in a communications system than a distributed network of regional processing centers.

The concentration of processing power lets the user centralize his software, maintenance and other DP functions, Shannon said.

With a proper mix of terminals and multiplexers in the field, the user can access his super center from any remote location, he said. The introduction of intelligent terminals into a communications system can "completely change" the characteristics of a data network, Shannon added.

AT&T will not suggest the use of multiplexers in a network because this is outside the service offerings" of the phone company, he said. In citing the advantage of multiplexers, Shannon said some networks had saved more than 50% by redesigning their routes and thereby reducing system mileage.

Shannon said the cost of service offerings from Bell can actually degrade performance in a data network, Shannon suggested. In a system with peak loads, a shift from regular dialup service to "Wats lines might prevent some messages from getting through because too many lines would be available at the central DP site.

In addition, users should be concerned with the additional-time rates on Wats

rather than deciding strictly on the initial period rate, he said.

## Cutting Line Costs

One of the most effective ways for users to cut line costs is the design of least distance networks, Shannon said. Many networks expand in growth stages without considering the overall operating pattern in the system, he said. The selection of network tie points, or nodes, should be determined by such factors as traffic patterns, multiplexing needs and telephone rates, he continued.

While private line multipoint networks afford the best economies of scale in a large network, the user should retain dial-up lines for backup, he said.

## Common Carrier Services

In a review of common carrier services, Robert Brewster, vice-president of Digital Systems Corp., said it is usually less costly to derive low-speed channels from one wideband link than it is to lease similar 100 Series channels individually from the telephone company. Deriving such channels via the use of independent multiplexing equipment is usually cost effective, he said.

Most significant in determining minimum rates on private line systems in total mileage, Brewster said. The phone company uses a vertical/horizontal grid pattern to determine the distances between toll centers, he said.

"VH coordinators" should be utilized by users when optimizing their network distances - the complete coordinate system for all toll centers is published in Tariff 255, he said.

In opening remarks to the seminar attendees, Dr. Thomas Kurtz, director of the Kiewit Center, said communications planning has been "an essential part" of the Dartmouth time-sharing system. In designing the Dartmouth network, it was the Dartmouth-Dartmouth-30 processors would act as the main CPUs with dual Honeywell 635 mainframes performing as "slaves," he said.

Citing the validity of this approach, Kurtz said it is important to "get the communications processing power out as close as possible to the remotest user."

## Manual Check Reverses County Election Results

ALBANY, Ore. — A routine manual check of a computerized vote count overturned the results of a recent election here.

Following the computer count it appeared that Ian Timm had edged out Vernon Schrock for the Democratic nomination for Linn County Board of Commissioners. But the usual check of results revealed votes missing from two pro-Schrock precincts, and the election was turned over to Schrock after the recount.

### News Wrapup

The miscount was caused by a programming error, according to Linn County Clerk Del Riley. Although the votes were registered in the two disputed precincts, the computer did not print out the results because of information omitted in one of the header cards in the controlling program, Riley said.

This was the first computerized election held in Linn County, and despite the problems Riley said the county will continue to use the computer, with safeguards built into the system to prevent such errors in future elections.

### N.Y. May Centralize Tax Data

ALBANY, N.Y. — The state Board of Equalization and Assessment is studying a plan which would put information used by tax assessors in one central computer. If implemented, the program would enable any tax assessor in the state to obtain sales and market data to determine the "fair market value" of any piece of property.

The plan is still in the research stage, according to Robert Kitchen of the state board, but if approved, the first stage would be a physical inventory. "The first step is to know what we've got in this state in terms of the value of taxable property," Kitchen said.

The goal of the computerization, he said, "is to obtain equality of property taxation within a city, town or village and between municipalities, so that similar tax parcels will bear proportionally equal shares of the tax burden."

### Aussies Probe Privacy Threat

SYDNEY, Australia — A judge has been appointed to lead an inquiry into ways of protecting an individual's privacy by controlling the storage in files and computer banks of personal information.

The inquiry will concentrate particularly on the activities of credit bureaus and similar agencies, the federal attorney-general and the attorneys general of the Australian states decided at a recent meeting.

They agreed to appoint a judge to make an intensive investigation which would seek the views of all interested parties, including sociologists, members of the computer industry and those responsible for collecting and compiling public records and statistics.

### Vaccination Data Bank Due?

ATLANTA — The Center for Disease Control is trying to get airlines to computerize the vaccination requirements of 160 nations in an effort to centralize information for travelers and reduce unnecessary vaccinations.

The computer program has been written but the efforts to get the airlines to adopt the procedure are in the preliminary stages, according to Dr. Arthur S. Osborne, chief of the center's foreign quarantine program. He said center spokesmen have been discussing the computer project with officials of the Air Transport Association.

Osborne said the computer would contain current information on each country's required vaccinations, as well as other recommended shots.

Presently, the center provides country health offices with weekly reports on any

changes in vaccination requirements, as well as any emergency changes.

### Small Firms Get IRS Eye

WASHINGTON, D.C. — The Internal Revenue Service will use a computer to screen all tax returns of small businesses next year, a move expected to bring in \$42 million in additional tax revenues, according to Assistant IRS Commissioner John Hanlon.

According to IRS sources, possibly less than two-thirds of the nation's small firms (assets of \$1 million or less) are conscientiously paying the taxes they owe under the law. This compares with a 97% compliance rate among corporate and individual taxpayers.

IRS plans to implement the computerized procedures next January, along with assigning more IRS personnel to the small business area.

### NSF Aids Faculty DP Training

NEW YORK — The National Science Foundation has awarded \$670,774 to

support a regional cooperative computer network which will involve the State University of New York (SUNY) at Binghamton and 15 other participating New York State institutions.

The primary purpose of the project, entitled "A Consortium for Faculty Education and Curriculum Development Via Computer Resources," is to provide education in the instructional use of the computer to selected faculty members at the participating institutions.

### See You Again in 96 Years!

PHOENIX — James Stokely, street maintenance director here, has earned a nice long vacation, according to a city hall computer. Officials said a keypunching error caused the computer to issue Stokely 96 years of vacation leave.

"I do not know just how this wonderful miracle came about," he said with a straight face. "But, as I have been taught to accept the infallibility of modern data processing, I find no reason to question it."

## Ticket Fixers Fixed

LANSING, Mich. — One way to avoid computerized summonses is to eliminate one stage of data processing: input. Five women employed in the DP division of the city's Traffic Department did just that recently, throwing out traffic tickets issued to their cars or to cars of fellow workers.

A suspicious meter maid uncovered the ticket-fixing, after ticketing one car several days in a row, local sources noted. She reported the fact to Herman Dallman, parking division supervisor, and he found traffic tickets in the waste basket.

A two-copy traffic ticket is now being replaced with a third copy for Dallman, to eliminate the temptation to the workers, local sources said.

After recent city hall hearings, the two keypunch operators who were determined to be "most involved" were suspended for a week without pay and demoted to the lowest pay grade; the other three received letters of reprimand, according to Bob Powers, assistant DP director.

## Optimum tape subsystems for 360 and 370



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## Proposes Board to Review DP Use

# British Study Discounts Computer Privacy Threat

By Joseph Hagan

Special to Computerworld

LONDON — "The computer problem as it affects privacy in Great Britain is one of apprehensions and fears and not, so far, one of facts and figures. We cannot conclude that the computer is at present a threat to privacy," so said the Younger Committee on Privacy in its long-delayed report issued this month.

The government committee decided the time was not right for detailed control of computer data banks because of lack of evidence of abuses and "because of the speed at which the computer industry is developing and the importance of not impeding its legitimate progress."

### New Commission

The committee proposed a new standing commission be set up to keep the use of computers under review (effectively an extension of the Younger Committee). It also detailed a voluntary code of conduct for handling personal information.

Although "the privacy of computerized personal information... has attracted by far the most attention," the committee considered all forms of privacy invasion in the private sector.

The committee strongly opposed any new legislation in nearly every area, arguing that banks, the medical profession and universities could best handle their own privacy problems voluntarily.

It urged strong legislation to curb the use of electronic surveillance devices (under many circumstances, bugging and wiretapping are legal in the UK, the committee noted) and milder legislation to regulate credit bureaus. The committee voted 14 to 2 against proposals for a legislated general right of privacy.

The softened recommendations brought

criticism from civil libertarians. Leslie Hunkeler, Minister of Parliament, called the committee "a timid mouse." The National Council for Civil Liberties (NCCIL) charged the committee "had neither courage nor insight" and that its proposals were "breathlessly inadequate."

The NCCIL noted the issue of computers is the "most important," but that "this section of the report is certainly the weakest. The proposal on data banks do not measure up to the urgency of the most grave and immediate threat to privacy," it added.

The proposed "toothless" commission "in five years too late and merely another version of the 'wait and see' approach of which the committee itself is part," the NCCIL charged.

The committee's report seemed based on its inability to document more than a few abuses (none in the computer area) and on what it perceived as little public interest (it received only 214 unsolicited letters).

The Younger Committee conducted its hearings in secret with little press coverage, and apparently made little attempt at investigation outside the committee room. It conceded: "We were not able to estimate the extent to which personal profiles are being compiled in the private sector, nor how much correlation of information is taking place, nor how many cases of unauthorized access there may have been."

The NCCIL charged the committee failed to realize that "it is hard to come by detailed information on invasions of privacy because such invasions go on in secret; most victims do not know their privacy is being invaded."

The committee's hesitancy on computer data banks surprised many observers because of five points stressed in the report:

- Abuses feared by the public are now technically possible.

- "We are not convinced that considerations of privacy are at present sufficiently in the minds of computer users."

- "Technical means exist or can be devised to provide a very high degree of security over the handling of information by computers."

- "The level of security to be achieved by a system should be specified in advance by the user and should include precautions against... misuse of information."

- It will cost far more to add security provisions to systems after they are built than before. The committee quoted an International Computers Ltd. statement that security facilities added during the design stage would increase costs by 5%, while the same facilities added to existing systems would cost 25%.

### Standing Commission

The proposed standing commission would "keep under review the growth and techniques of gathering and handling personal information on computers." Such a commission would have computer professionals as members, would collect information about computer data banks, receive complaints about invasions of privacy and make recommendations for legislation.

The committee urged that the new commission should immediately consider licensing of computer data banks and the "reasonable person" concept. The "reasonable person" would be a supervisory official at each installation who would be personally liable if information were mis-

used.

Finally, the committee proposed the standing commission should be permitted to scrutinize government computers, a right refused to the Younger Committee.

### Propose Voluntary Code

The committee's 10-point set of "principles for handling personal information" requires:

- Information should not be used for purposes for which it was not supplied; in particular, the sale of a mailing list of names and addresses of magazine subscribers is "a clear breach of privacy."

- Where data is being used for statistical purposes, identities should be separated from the rest of the data.

- The subject should be able to find out what information is held concerning him.

- A monitoring system should be required to detect security breaches.

- In the original systems design, security should be specified and limits set on how long information can be retained.

- "Care should be taken in coding value judgments."

### Credit Bureaus

Credit reporting agencies also were covered. Of the three national reporting services, one hopes to be "fully computerized" by the end of this year, while the other two have decided that computerization is too expensive at the moment.

The committee declared: "We do not consider that comprehensive legislation on the lines of the U.S. Fair Credit Reporting Act is required." The committee only recommended "that an individual should have a legally enforceable right of access to the information held about him by a credit rating agency."



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## MITRON ANNOUNCES OFF LINE POOLING TERMINAL WITH AUTOMATIC DIALING



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Remote terminals are manually dialed or an optional automatic dialer will sequentially poll remote terminals for data collection or transmission. A 9-track 800 BPI drive is standard; 7-track 556 or 800 is optional. System options include Ascii to Ebcidic code conversion. The MDRS-9 is available for rental or purchase.

Current users include oil, insurance, motor freight, paper products and household products companies, service bureaus and Government agencies.

## Mitron Systems Corporation

5028 Herzal Place  
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# HOW TO RENT A MINICOMPUTER.

**1** Just try to find one. Until now, rental companies and minicomputer companies just haven't been very interested. The mini business was built on purchase orders, and it's hard to break old habits.

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## Technology/Society -- Part II

## Public as a Whole Must Decide Technology's Course

By E. Drake Lundell Jr.  
Of the CW Staff

CAMBRIDGE, Mass. — Because the effects of technology — in particular, computers — can be extensive and long-lasting, decisions about the course of technological development must in-

This is the second in a series of reports on the conclusions drawn from the eight-year Harvard study of the relationships between technology and society. Part I (CW, July 19) discussed reasons for the failure of computer-based information systems to fulfill their early promises to aid in governmental decision making.

creasingly be made by the public as a whole through political mechanisms rather than by individual entrepreneurs. So stated Emmanuel G. Mesthene, director of Harvard University's Program on

Technology and Society, in "a final review" of the eight-year program that was supported by IBM.

Even though the report is the final one from the Harvard program since it was decided to redirect the funds from IBM to professionals instead of research, Mesthene said "it is final only in the sense that it marks a stopping, however, not a culmination or conclusion."

"Research in the technology and society area," he added, "has barely begun and much more needs to be done."

In his introduction to the work of the scholars connected with the program, Mesthene said the development of new technologies leads to social changes because new forms of organization and sometimes new institutions are required to take advantage of the opportunities and guard against the dangers that technology brings with it.

One major issue in the area "has to do

with the implications of new technologies such as computer systems for public decision making, and, more generally, for the organization" of the nation.

"In relation to the decision-making process itself, questions arise about the desirability, feasibility and further consequences of using technical aids such as computer-based information systems and scientific management techniques such as systems analysis," he stated.

## Aids Necessary

"The problems of modern societies have become so complex and their ramifications so hard to anticipate that it seems patent that some such aids have to be used; tradition, political instinct and national habit no longer provide a sufficient basis for social policy," the director added.

"Yet," he warned, "the prospect of employing such technical decision-making

aids raises new problems. For example, the results of computer simulations and systems analysis are delivered mainly in quantitative form, which can lead them an aura of rigor and infallibility not justified by the hardness of the data or the vagaries of the assumptions on which they are based.

"They may thus come to be relied on disproportionately, especially in decision-making situations in which the issues are large and the uncertainties great."

In addition, Mesthene charged that effectiveness of such computer-based techniques cannot be "easily determined" by the average policy maker in government or the average man on the street.

Therefore, Mesthene said, if their use becomes widespread, "there is a danger that the experts who use them may come to have too great a voice in the determination of social policy."

"Conversely, there is a danger that such techniques will be used to give a 'scientific' and therefore incontrovertible appearance to decisions or policies that continue to be based on self-interest and political compromise."

"There is already some evidence that introduction of information systems into government has left old political habits and alignments unaffected," he stated.

The most important problems technology raises are thus political problems, Mesthene argued.

"They involve more than the application of new machines or new techniques; in the end, they raise questions of institutional change," he postulated.

## Threat to Privacy

In addition, he noted that the application of the new technologies, especially computerized information systems, raises the threat to individual privacy through the "ease with which computerized systems can be used to store and retrieve large masses of data about individuals."

Technology also exerts pressures on the values of society, in the direction of more collective value orientation, Mesthene noted.

Values once held in high esteem become no longer appropriate and may become actually harmful in a high technology societies, he stated.

Rugged individualism, for example, "cannot be allowed free rein in a society in which every act increasingly has unintended or unforeseen consequences on third parties and where actions taken for individual benefit may carry social costs that will impoverish every one in the end," he said.

"Many of the tensions of technological society are the result of a natural tendency to hold on to values too long after they have been superseded by events," he claimed.

The social tensions that arise from the application of computers and other new technologies are often "exploited by some individuals, groups and politicians for their own purposes," he added.

"The challenge to research and inquiry — and eventually to policy — is to find out why the old economic and political forms are not working and to modify them or design new ones that will both preserve the fundamental values of society and yet be adequate to modern technological realities," he concluded.

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## Patients, Computer Linked

SAN DIEGO — Doctors at the University Hospital here are planning to link patients undergoing surgery by wires and a telephone network to a computer at the University of California in San Diego, 10 miles away.

The computer will take brain wave readings, analyze them and give the doctors up-to-date information on the condition of the patient, while the surgery is being performed.

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## Editorial

### Change for the Better

The Joint Computer Conferences are dead. Long live the National Computer Conferences.

The question now is whether AFPS, its member societies and all the non-member societies and associations are really willing to work together to make the change.

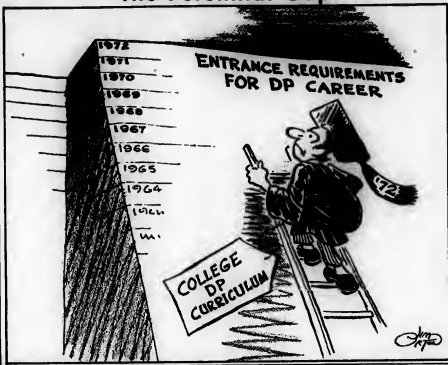
The joint conferences originally were national conferences where people with very different day-to-day problems could get together to discuss common problems.

But as data processing has grown in importance within specific industries, there has been a trend toward holding "vertical" DP conferences within these industries. Implicit in such parochial conferences is a belief that banking DP is different from, say, retail DP.

Actually, everyone in the DP community has the same problems: source data automation, efficient processing and delivering responsible output in an efficient manner to those who need it.

It's time for all the societies and associations to get together to sponsor a truly national conference that will meet both the individual and the collective needs of the DP community.

## The Perennial Gap



## Letters to the Editor

### Dual Processing May Solve DP Addressing Problems

Your reader, the "Mail Stop" (CW, The Taylor Report, July 12) is not alone, nor is it inaccurate in its assessment of the need for improved systems work in the discipline of name and address processing.

Alan Taylor's recommendation for the development of standards in computerized addressing methods is sound; however, first the postal service and the cities and towns throughout the U.S. must agree on standard address definition and assignment techniques.

Urban Data Processing specializes in computerized census coding and zip-coding of name and address files. The experience of processing millions of names and addresses has taught us there will always be another exception. For example, the midwestern city that uses a 10-digit alphanumeric code for house number!

Our solution, designed to maximize the percentage of names and addresses which we can successfully process without manual intervention, is dual processing. During the preprocessing run we normalize the input file to our convention. During the processing processing run we execute a series of validity tests while matching to the directory table.

Although we've never hit 100%, we have succeeded as much as 97.6% of a file successfully. In addition, we assign error codes to rejected name and addresses in order to facilitate manual correction.

We have also successfully applied this concept to the elimination of duplicate names and the grouping of individual names into household units.

M.F. Eveleth Jr.,  
Vice-President, Marketing  
Urban Data Processing Inc.,  
Cambridge, Mass.

### 'Trial by Data Bank?'

A further item in the grand march of government data processing: the FBI article on the front page of the June 14 issue. I had to read it a few times before the basic idea came clear — that the FBI believes existence in the NCIC files is sufficient cause for "terminating"/"ending" a budding career."

Note how much (or, more precisely, punishment — deprivation of employment) now becomes a very simple matter of

querying the file. Why bother with archaic delays like courts and juries? "Sentence first, trial later" as the Red Queen said to Alice.

I strongly resent this self-serving brainwashing by the FBI. How goes the case of the Boston taxi driver whose license was revoked because NCIC erroneously showed him as "case unsettled" on a drug charge?

I think we are long overdue for some really serious challenges to the legal significance of NCIC data files and the whole syndrome of "trial by data bank." Robert Higgins  
St. David, Pa.

The city, not the FBI, dismissed the employees. Ed.

### Byte vs. Bit Controversy...

I disagree with your comment on page 8 of the June 28 issue, stating that users are more interested in byte capacity than in bit capacity, and thus the Univac 8450 disk system is bigger than the Burroughs 9484.

Following such logic, a 1K bit/byte disk would be "larger" with only 1/17th the capacity. It is true that the software of most 8-bit, byte-oriented vendors tends to underutilize storage capacity, but it's still not fair to say they have a smaller disk. Perhaps a smaller "effective storage capacity"?

Dennis J. Fraley  
Assistant Professor  
Southern Methodist University  
Institute of Technology  
Dallas, Texas

### A Significant Difference

The June 28 issue of *Computerworld* contained a letter from Mark Lutvak of Burroughs disputing Univac's claim to the largest capacity disk subsystem in the industry. If Lutvak's statement that the computer system utilizes 6-bit characters is correct, then your response to his letter is inaccurate and misleading.

A byte is recognized in the industry as an 8-bit storage unit, capable of storing two numeric characters of 4-bits each or one alphanumeric character of eight-bits (256 possible characters). Since most computer systems utilize 6-bit characters is numeric in nature, the difference is significant.

You are correct in stating that users are more interested in byte capacity than in bit capacity. But if the Univac system provides 2.2 billion 6-bit characters vs.

the Burroughs' claim of 1.9 billion 8-bit bytes, the potential numeric storage is 2.2 billion for Univac vs. 3.8 billion for Burroughs, with Burroughs the obviously larger capacity system.

It may be a "piety" type of issue but sometimes the advertising claims of "biggest and most" should have the necessary dose of salt applied before acceptance by the data processing fraternity.

Robert L. Sullivan  
Data Processing Manager  
Electronics Corporation  
of America  
Cambridge, Mass.

Neither And nor IBM define a byte as eight bits. Although 8-bit bytes do allow the use of packed decimal, it does not follow that all numeric data is likely to be stored in packed form. However, we do agree that expressions such as "largest capacity in the industry" tend to have little real importance, and we try to avoid using them. Ed.

### Assembler Not Only Answer

I have just finished reading David Ferguson's new column, "Ferguson on System 3", in the June 28 issue.

There must be a widespread but specific psychological relationship between IBM users and their vendor. Listen to this quote from Ferguson's article:

"If he [the S/3 user] is programming in RPG and runs out of storage space, he simply buys more core. He is told he has to do this and doesn't recognize that there is an alternative."

What alternative? Why, training someone in assembler:

"The RPG program, for instance, which requires 16K of core might require only 8K if coded in assembler language."

The real problem is lack of compatibility between assembler-based hardware design and programming systems (such as RPG and Cobol) aimed at speeding up the task of programming. For years, IBM users have learned the hard way that the small- and medium-scale users must resort to assembler for critical applications. By advocating increased use of assembler language programming to obtain hardware efficiency, Ferguson and Group's are not "fighting" IBM, as his closing sentence implies. They are merely submitting to IBM's rationale.

Reading Ferguson's avowals of loyalty to IBM in the face of IBM's callous disregard for his problems made me rediscover a fact that has been apparent for many years: IBM users who accept the "facts of life" dictated by IBM — as if they were hearing the Sermon on the Mount — deserve everything IBM gives them.

As for me, I'm looking hard at the Burroughs B1700. What I see there is an honest and exciting attempt to solve some of my problems as a small system user — particularly with regard to handling widely diverse programming languages with optimum efficiency in each case.

There is no doubt in my mind that the Burroughs concept of a "virtual machine" — like the concept of virtual memory Burroughs introduced in 1960 — will eventually be "discovered" by IBM, probably about 1976 or so, when it can no longer deny its existence.

Van B. Thompson,  
Manager

### Indicate Object Coding

In your description of Capex Corp's Optimizer package [CW, Special Report, June 28], the general statement regarding the Perform statement is not valid. The statement "every procedural paragraph . . . ends . . . with a dummy branch . . ." does not apply universally to all Cobol compilers. Since each vendor or software house will hopefully generate object coding which will optimize a verb in the source coding, the writer should indicate the Cobol object coding to be run with the package.

In the future when discussing any software which operates on other software, please indicate which software is used as test data and the software it will operate on.

I. Z. Nitzberg, CDF  
Director, MIS

Secaucus, N.J.

The original comment might have been better if it said "procedural paragraphs cited by a Perform statement . . . end . . . with a dummy branch . . ." Capex's Optimizer is designed for use on OJ240 Cobol "F," and ANS Cobol Version 2 and 3. Ed.



# Here Are Achievements to Make a DP School Proud

The Computer Processing Institute in East Hartford, Conn., is one of the schools I have had the good fortune to inspect as part of the Furr Challenge Cup contest.

I was delighted because I found at least five major items worthy of being called real achievements, giving honor to the school and to the data processing profession.

The entry requirements, for instance were also aimed at the achievement pattern of the PAT test — the way the scores from one part were reflected in the achievements in other parts of the test. The idea was to check that student records were consistent with what the school believes to be a pattern of success.

It is not surprising that the school has taken this approach. Dr. Harold Bingham, who is responsible for admissions, has been in education for over 40 years and has brought to data processing an understanding of how schools and universities really look at examinations.

## Better Appreciation

A study of the way people pass the test may well give us a better appreciation of what is needed than we currently have. By

knowing what success really requires we may be able to end some of the selling tactics that induce students to think that practically nothing is needed to enter data processing.

Bingham has actually gone considerably further than merely dealing with comparative ratios. He has, for instance, instituted a full refund probationary period. If the results of the test a student takes in class on the first morning do not agree with the test results prior to entering the school, he will be put on probation. This probation period can last up to six weeks. If his work is not approaching standard, then the school will tell him it does not think he is suitable material — and will give him a full refund!

Even though he has received six weeks of classes! So there are two things the school is doing which I do not think are normal practice. I think both of these are well worth considering by the judges of the Furr Challenge Cup Contest.

## Simulated Companies

In the classroom, I also found a very helpful innovation. About 18 months ago, Joyce Rabinoff, an instructor, initiated a program in her classes which has since spread to other classes in the school.

The program sets up a few "companies," which have officers, such as the president, the auditor, manager, the programmers, etc., and they compete with other companies to perform various tasks.

Her idea was to bring an understanding of the typical organizational conflicts that occur in real DP installations. These are not normally familiar to the students. Judging by the conversation I had with some of the students, I think she is succeeding, and succeeding without disturbing the routine work of all the students. That is another real achievement for which I can respect the institute.

These are, of course, items which help the DP students. But our DP schools have greater duties than to their students. They also owe some duty to our profession. They are a part of the DP professional community, and therefore like ourselves, they are bound to be interested in the maintenance of the professional image.

Many people and institutions say they are interested — but Computer Processing Institute is one of the comparatively few schools that can honestly say it has put its money where its mouth is.

## Saving Stranded Students

One example of its actions came about a year ago when one of the other DP schools in the Hartford area (one of a chain of schools, incidentally), suddenly collapsed. With this all too frequent occurrence there are usually no assets left, just some accounts receivable which may, or may not, be able to be collectable, and some very hurt students and staff.

There are also liable to be some irate state officials trying to see what can be done, and hopefully

also trying to prevent such occurrences in the future.

Computer Processing Institute was approached by the state last year about such an instance. Its reaction was to take on the students and help them complete their courses. In fact, it did more. It put them through, on an average, double the length of time they were due under their original contracts, because it felt they should go through a complete course rather than try to make do with two half courses. The school did this for the accounts receivable only. In my opinion it must have suffered a considerable loss. But in doing it the school certainly helped the name of the DP profession. I think that is another reason why the judges will have to take Computer Processing Institute very seriously as a candidate for the Furr Challenge Cup.

Not is that the end of the school's involvement in community matters. There is a wider community we are all interested in — the society at large — where the school has also been active. Here it has realized that there are many people who for physical, or other reasons, need rehabilitation. They have served the country at home and overseas, and now look to the country to help them in their time of need.

Working with the Veterans Administration, Computer Processing Institute, has admitted into classes in the past year many temporarily or permanently disabled veterans. It has treated them just like the other students (except for watching

out for some of their special needs) and has helped in many cases ease their way back into society as valuable citizens. In some cases it has been able to see them develop and earn their own living.

This has not been done on a token scale. In some cases classes have consisted of up to 25% handicapped students. There have been problems but the school has persevered, and has helped society.

There are items, of course, about the school which bring some criticism. David S. Shefrin, the president, himself a member of the Society of Certified Data Processors, is well aware of these items but I believe he is willing and able to respond constructively to criticisms. He has already received some of these criticisms, and I am pleased to say, taken action.

But, I believe that if every school in the country was as good as the Computer Processing Institute we would have little worry about whether DP schools could hurt the image of our profession. Instead we would be trying to see whether or not the profession was living up to the standard provided by DP schools.

And, you know, that is just how it should be! Schools should lead in professionalism.

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## The Professional's Viewpoint

# EDP Auditors Vote for CDP as Well as CPA Certificate

Many comments have been received from professionals on the recent discussion of qualifications for a CPA-like certificate—and, in particular, whether a CDP or CPA certificate, or both, are required for individuals giving such certificates.

Two of these comments, from individuals with both qualifications, follow.

### EDP Role Broader?

"The points made in *The Taylor Report*, 'Who Is The Ideal EDP Auditor—a CPA, CDP or Both?' [CW, June 7], were meaningful, in particular the statement that auditors have not yet determined what their role is.

"The purpose of the audit function is to help management evaluate the effectiveness of the operation of the company and to ensure that effective controls are being maintained.

"Historically, the mechanism through which this was done was by interpreting

financial records of the company, checking to see that these records were in order and that adequate controls were being applied. The function of the auditor was further expanded by performing management or operational-type audits.

"Webster defines an auditor to be '1. one that hears or listens, 2. one authorized to examine and verify accounts; 3. one that audits a course of study.' He also defines the term audit in several ways, e.g., 'a methodical examination and review, to examine with intent to verify, a formal or official examination and verification of an account book.'

"Note that on the one hand he ties the function of auditing to the 'books of account' and, on the other hand, leaves it

open to 'examination and review.'

"I submit that the EDP auditor's role is considerably broader than the traditional auditor's relationship to the books of account.

"We should not identify the term auditor in the generally accepted connotation as related to books of account, but rather in the more dynamic concept as part of the management team. Auditors should represent the analytical and integrational extension of management from a systems viewpoint.

"Because of the significance of the EDP operation, the EDP auditor should constantly play the 'devil's advocate' for management, challenge the justification for doing things a certain way, and assure that management awareness exists as part of the operational environment.

"Perhaps the EDP auditor should be called a systems auditor, since his role encompasses more than just the EDP

operation.

"Taking this a step further, one might ask: Just how broad is the function of the 'EDP auditor?' My answer is, 'As broad as necessary to ensure the effectiveness of information flow through the company.'

The EDP auditor should ask the question, 'Since management's function is to make decisions, is the information on which those decisions are based accurate and adequate for that purpose?'

"Management must feel confident of the bases of its decisions and as an extension of management, the auditor must to the best of his ability provide that support.

### CDP Valuable

"If one takes a cue from the Taylor article what kind of background must the EDP auditor have? I concur that while being a CPA provides a basis of authority for visible financial control, it provides little basis for commenting on the EDP system operation and related controls.

"An effective EDP auditor parallels the domain of the systems analyst but operates primarily in the post implementation environment.

"The difference is that his role is not an interpretive one (i.e., defining and implementing customer requirements) but rather one of probing and testing to evaluate the effectiveness of the system operation. The effectiveness of the EDP auditor is dependent on his background and how good he is as an analyst.

"Combined with an inquiring mind he must apply his expertise as a programmer, systems analyst, operational manager or whatever. I would expect that broadness of exposure in most of the EDP disciplines combined with a depth of experience in several of these areas, plus the inquiring mind, plus an understanding of the management philosophy would provide the optimum EDP auditor.

"Having a CDP does not guarantee any of this just as a CPA certificate doesn't guarantee that an accountant is more effective than one who hasn't achieved it. It does, however, represent a level of achievement and to that extent assures at least a certain level of DP knowledge."

—Howard Friedman, CDP, Los Angeles, Calif.

### Who Shall Audit?

"Who audits—data processor, internal auditor, independent auditor or consultant? The answer depends upon the nature of the workload, size and complexity of the EDP installation and available expertise.

"Generally, routine audit controls should be designed into the EDP computer and application systems or else exercised by the DP organization. Supplementary non-routine audits should be performed by the internal EDP auditor in a larger organization or EDP or MAS (Management Advisory Services) consultant in a smaller installation which cannot justify a full-time internal (EDP) auditor.

"What about third-party certification of EDP outputs?—So far, only independent audit firms (of CPAs, as an outgrowth of their traditional certification of financial statements) have received widespread public acceptance in this area. The data processor, internal auditor and consultant are lacking in one or more of the prerequisites for third-party certification. The prerequisites referred to are public acceptance, independence, audit competence, accounting competence and EDP competence.

"EDP Auditor—CDP or CPA?—The prerequisites for an EDP auditor performing the array of audits described above would necessitate expertise in auditing, accounting and data processing. Consequently, both CPA and CDP certificates would be desirable."—Stuart Tynauer CPA, CDP, Founder, EDP Auditors Association.

## Effective data systems have communications built in. Not built on.



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# SOFTWARE & SERVICES

## Random Notes

### Mini-Biz' Applications

#### Adapted to Run on S/3

ENGLEWOOD, Colo. — A package of business applications originally intended for minicomputers, Mini-Biz, will be available for IBM System 3 CPUs by the end of the year, according to the developer, Computing Corp. International (CCI).

The package includes billing, inventory control, accounts payable and receivable, payroll and financial reporting.

Mini-Biz also includes a generalized RPG, a sort, data base set up, maintenance and analyzer routines and a library of CALLable disk file handling subroutines. CCI provides tailoring to fit user needs, so prices are negotiable, a spokesman said from 3385 South Bannock St., 80110.

#### 'Text' Processing Added to UTS For Xerox Sigma 6, 7 or 9 CPUs

EL SEGUNDO, Calif. — Text processing for typists working at terminals linked to Xerox Sigma 6, 7 or 9 CPUs is now possible with the Text software package that operates under the Universal Time-Sharing System (UTS). As with similar programs, Text supports creation, editing and printing operations related to documents.

The Text system retains the typist's work, with all corrections, revisions and formatting instructions, in main memory, to generate the desired document on demand. The package is free to Xerox Sigma users.

#### Merchants Gain POS Support With Links to NCR Systems

DAYTON, Ohio — Point-of-sale data capture and rapid analysis are available to small retailers equipped with NCR 280 data terminals and an NCR 723 data collector, through a service provided by the NCR data centers.

The data collector stores information on mag tape until polled by the center by phone. A "Flash" sales reports are then prepared and transmitted to the store by data line or by facsimile copier.

#### Time-Sharers Can 'Gossip'

BOWIE, Md. — Gossip, an interactive information retrieval system, that can perform permutations and other mathematical operations on data files, and generate reports according to user specifications, is now available to users in the Mid-Atlantic area through the time-shared, H-635-based facilities of Keith Lawrence Associates.

The software is also available for installation on user in-house equipment, the company said. It can be reached through P.O. Box 590, 20715.

## Special Languages to Multiply: Sammet

CAMBRIDGE, Mass. — As long as people enjoy developing languages, as long as they want something tailored exactly to their needs and as long as they find pleasure in the proliferation of high-level languages will continue into the foreseeable future, according to Jean E. Sammet of IBM.

Speaking at a recent Boston chapter meeting of the Association for Computing Machinery (ACM), she said the ease and efficiency of using a language particularly suited to a specific application area is a desirable result which outweighs the disadvantage of the proliferation.

There are more than 165 different high-level programming languages in use in the U.S. today, and roughly half of these can be considered "languages for specialized application areas," she noted.

Within the latter definition, she included all programming languages "except those specifically intended for mathematical computations (both numeric and non-numeric), business DP, string and list processing or any combination of these exclusions. The excluded categories, she said, seem "so fundamental to the use of computers" that none should be considered as being specialized.

While functional capability, a style suitable for the application and efficiency must be design parameters of any language developer, the methods actually used to design and implement the languages are perhaps more significant in the specialized area, she said.

The intended users of these languages are not professional programmers and are likely to be less tolerant of unnecessary idiosyncrasies.

Computer-assisted instruction (CAI) and Numerical Control (NC) are two areas in which specialized languages proliferate even though the basic purpose in each area is already known, Sammet added.

## Isam Replacement Saves Space, Time

By Don Levitt

Or the Coast

HACIENDA HEIGHTS, Calif. — IBM 360 users currently working with Indexed Sequential (LIM) files may get more records in available disk space, gain faster updating and retrieval and cut the core space needed for the control software, if they reorganize their files, with The Access Method (TAM) from International Management Services (IMS).

TAM uses techniques which eliminate overflow linkage, so that file additions and retrievals are handled faster. In addition, IMS claimed that TAM will reduce most Isam users' disk storage requirements by 20% to 40%, and takes 1K less core than Isam software.

#### Feeder Reorganizations

TAM supports files on 2311, 2314 or 3330 disk drives. It handles variable-block and spanning records, with all blocking and spanning occurring within TAM, transparent to the user. This is said to improve processing and lessen the need for frequent file reorganizations.

If a TAM file is properly set up, the company said, it is possible to avoid reorganization until the file nearly ex-

ceeds the disk area assigned to it. The file will retain the optimum processing speed despite the lack of reorganization.

TAM is said to support Rotational Position Sensing for the 3330. It also compensates for disk errors encountered during a file load, by flagging the bad track and proceeding to the next one to continue processing.

Described as an improved version of the DFTFO (track overflow) Type III package previously distributed by IBM, TAM

includes file load, backup and print utilities, and high-level language subroutine generation programs.

Each time an indexed file is accessed, TAM updates internal statistics including the number of records loaded, added or deleted, total tracks used and remaining, and the estimated number of records which can be added.

TAM is available on a three-year lease for \$7,500 or \$300/mo. IMS is at 2158 Salto Drive, 91745.

## Control Program Eases Disk Use, Multiprogramming on Singer Ten

CHICAGO — Users of the Singer System Ten CPU can gain enhanced multiprogramming capabilities and more flexible operations through an on-line real-time operating system called the Control/Control Executive (C/CE) from Tech-Systems Inc.

Use of an operating system runs counter to the concept of the System Ten which is built around a series of hardwired

partitions each capable of working with only certain I/O devices.

C/CE provides disk drive independence, allowing the user to transfer disk packs from one drive to another, for convenience or in case of drive failure. In addition, a "page in/page out" feature allows jobs to be interrupted for higher priority runs, then resumed.

Other routines within C/CE prevent unauthorized use of the system or specified parts of it, and support backspacing and error-retry for terminals.

#### Control System

The package includes Logical I/O Control System (LIOS) for all types of disk files including those with random, sequential, index-sequential and sequential-linked organization. Terminal I/O support enables the user to run the same or different programs.

A macro-assembler with disk-oriented program maintenance, a full set of file management utilities and overlay capabilities, and a program CALLable sort complete the C/CE package.

C/CE can be purchased for \$4,000 or leased for \$85/mo. Tech-Systems Inc. is at 2823 North Michigan Ave., 60618.

## IBM 2780 Emulated on PDP-11

EUGENE, Ore. — All standard features of the IBM 2780 terminal, plus some facilities unavailable in the IBM unit, can be provided on a DEC PDP-11/20 CPU, with an emulator package recently released by Oregon Research Institute (ORI).

Requiring no more than 8K storage and operating under DEC's DOS, the package supports transparent or non-transparent Ebclic character transmission, 2- and 4-wire operation, blank suppression in input and other normal 2780 capabilities.

Beyond that, however, it also provides support for the programmable real-time clock in the DEC processor. Cyclic Red-

undancy Check (CRC) calculations are handled through software.

In addition, diagnostic logic, with which messages are counted as they are transmitted to and from the PDP-11, is part of the emulator.

Working with the programmable real-time clock, the emulator user can interrupt interrupts in the processing cycle at set times.

At \$1,000, the emulator requires the DP-11DA synchronous line adaptor and either the programmable or normal real-time clock.

ORI's computer center can be reached through P.O. Box 3196, 97403.

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Minis are the greatest industrial tool since humans. They have all the advantages of a machine, with many of the capabilities of a brain. They can do hundreds of jobs that would be impossible for humans, and they make many other jobs economically feasible for the first time. They can't do everything, of course, but their impact on industry can hardly be underestimated. We'll speculate on the mini's industrial future, look at specialized equipment for industrial use, and provide an introduction to the makers of process control equipment.

**Computerworld's August 30th Minicomputer Supplement will cover the field — and it will be read by people who use the Mini:**

61% of the respondents to a recent Computerworld subscriber survey said their companies currently buy and use minis. Of the remainder, 57% said their companies will be buying minis within a year.

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# COMMUNICATIONS

## Voice, Data Combined Computer PBXs Geared to Data Usage

### Data Briefs

#### Data Services Adds Coupler To Teletypewriter Terminal

MAHWAH, N.J. — Western Union Data Services has added an acoustic coupler model to its 300 KSR exchange data terminal. The unit is a modified version of the GE Teletype 300.

The coupler/modem is compatible with standard Bell telephone handsets and the terminal operates at 110, 150 or 300 bit/sec.

The 300 is available in original-only and original/answer models for operation with other terminals or a CPU, the company said. The original-only KSR model costs \$140/mo while the KSR model costs \$230. The original/answer feature adds \$5/mo and lower-term lease rates are available. Delivery is 45 days from 16 McKee Drive, 07430.

#### MSI Has Portable Data Unit

COSTA MESA, Calif. — A portable terminal that can collect information, store it to an MOS memory and transmit the data to a CPU is available from MSI Data Corp.

The Source 1000 includes a 4K memory connected to a hand-held keyboard. Data is entered into the memory in a 4-bit code that is converted to Ascii prior to transmission, the firm said.

When the required data has been entered into the MOS memory, the user attaches the memory to an acoustic coupler which transmits the information at 1,200 bit/sec, a spokesman said. The Source 1000 terminal costs \$800 and is battery operated. MSI is at 1381 Fischer Ave., 92627.

#### Teletype Printer Rates Cut

BURLINGTON, Mass. — Computer Devices Inc. has reduced the price of its 030 Teletype printer to \$3,500 from \$3,500.

Lease prices have also been reduced. A three-year plan available through Data Dimensions Inc. now costs users \$99/mo compared to the previous \$110/mo, the firm said. Maintenance is provided by the Honeywell field service organization. Computer Devices is at 9 Ray Ave., 01803.

#### Compatible Coupler Offered

POMPTON LAKES, N.J. — An acoustic coupler compatible with the Bell 103A model, priced at \$99.50, is available from Tycom Systems Corp.

The Model 920 originally offered coupler operates at rates up to 300 bit/sec. It can be used with any terminal having an EIA RS-232 connector and can operate in full- or half-duplex mode. A carrier detect light is standard on the 920. Delivery is 30 days.

Tycom Systems is at 750 Hamburg Tpke., 07442.

#### TCA Plans Conference

SAN DIEGO — The Telecommunications Association (TCA) will hold its annual conference in San Diego, Calif., Sept. 26-30. The theme of the conference will be "Telecommunications: A Corporate Asset."

In addition to exhibits by more than 50 vendors, the TCA meeting will include panel discussions on interconnections and the role of the communications manager in controlling corporate networks.

Further information is available from Charles Buxton, TCA president, 50 Beale St., San Francisco, 94119.

By Ronald A. Frank  
Of the CW Staff

NEW YORK — For most users voice and data communications are two separate functions, each requiring special equipment. The voice user thinks in terms of PBX switchboards, while the data user deals with terminals, processors, peripherals, etc.

But more and more users are beginning to look at each area as part of a total corporate communications need. Already some users have connected minicomputers to their PBX.

And in Madison, Wis., a computer-like device installed at the local Bell central office automatically routes calls by connecting the user with the most economical type of circuit.

But these developments are relatively minor when compared to the computerized PBXs recently introduced in Europe by IBM and ITT.

The most elaborate of the new systems is the IBM World Trade 3750, described as an "information switching system." At first glance the 3750 looks more like a full mainframe than a telephone switching system. It includes a printer keyboard and is said to handle "any data terminal which transmits over a 2-wire line in the audio frequency range." By dialing the proper codes, the user can transmit to other terminals or access a mainframe system via the 3750, IBM said.

For data collection, the 3750 can assemble, check and identify each input message and store the information on its attached disk. The information can be transferred to a CPU via a phone line or punched paper tape. And the 3750 is connected to a mainframe, publication

## FCC Chief Notes User Complaints Of Bell Interconnection Quality

ANAHEIM, Calif. — The Federal Communications Commission has received complaints from users that Bell connecting arrangements are poorly designed, excessively large, prone to failure and actually degrade the telephone service for subscribers.

This summary of complaints related to interconnection requirements was given by Bernard Schuchman, chief of the FCC's common carrier bureau at the annual meeting of the Utilities Telecommunications Council. Users also complained that connecting arrangements were incompetently installed because phone company installers were not properly trained, Strassburg said.

"The Bell System acknowledges the existence of such problems," he says they are not representative of the general situation, Strassburg said. AT&T attributes most of the interconnection problems to its efforts to "expedite a new program in a large and complex organization such as the Bell System," he added.

Overall, the existing carriers have been complying with FCC interconnection policies and programs, although "at times grudgingly," the bureau chief said.

#### Severe Critic

Strassburg was not so tolerant with the state regulatory commissioners, including influential governing hierarchies of the National Association of Regulatory Commissioners (Narcus) which is characterized as the "severe critics" of interconnection.

The state regulatory commissioners and Narcus "are by no means representative of the total regulatory community," but their views can significantly affect the future of interconnection, Strassburg said.

phones can be used as inquiry terminals with an audio response system.

The 3750 is an upgraded version of IBM's 2750 which has been available (also in Europe) for some time. The 2750 can support such terminals as the IBM 1050 and 2741 and telephone traffic information can be recorded by a 360 or

710 includes a data-handling subsystem that can handle more peripherals than the IBM 2750 and 3750 systems. While the IBM 3750 includes an associated disk, the 710 can handle a 400 line/min printer, a drum expander from 53K to 852K, a paper tape reader/punch and "IBM compatible magnetic tape

## Consultant Lists Drawbacks

NEW YORK — While the capabilities of the computerized PBX seem attractive to data users, most communications experts believe their introduction in the U.S. is still several years away.

One consulting firm that has studied the independent PBX vendors is Dittmer Associates.

Even in Europe, communications use of the new PBX systems is still very limited, according to Donald Dittmer, president. "The IBM system is not getting the amount of data usage that had been anticipated," Dittmer said.

"These systems are only meaningful in a data collection mode; and going through the PBX isn't always attractive because the user has to tie up a line dedicated to one terminal. Also, the software currently available for computer polling is not designed to go through a PBX before it connects a terminal," he added.

But Dittmer agrees these problems will be overcome. Within two years, he said, at least three companies will supply the computerized PBX systems and two of these will be U.S. vendors, he believes.

"Computerized PBXs will become available in this country only when there is a market for such systems," according to Bob Leopold, president of United Business Communications. "There isn't a requirement for switched data on the user's premises," he added. All data is usually transmitted to a DP installation and is via a leased line or over the phone network, Leopold said. "We really haven't yet exceeded the capabilities of conventional PBXs," he added.

#### System 3

Another European vendor that offers equipment to handle data through a PBX is ITT.

The ITT 710 system is described as a "processor-controlled system that provides a complete range of communications features when added to a PBX. The

But some experts think the computerized PBXs are too expensive when compared with conventional switchboards. "A 100-line voice PBX compared with the IBM systems would cost about one-fifth as much," one source suggested. The purchase price of the IBM 3750 "starts at" \$256,000 with rentals beginning at \$5,700/mo, IBM said. A 100-line conventional PBX system would cost about \$50,000, one expert estimated.

In keeping with its policy of not commenting on unannounced products, an IBM World Trade spokesman said there were "no plans" to introduce the 2750 or 3750 into this country.

Another supplier of computerized PBXs could be AT&T, but a spokesman said the Bell System does not have such a product.

But despite the denials, there are strong indications the vendors are looking very carefully at the relation of computers and PBXs. One industry source said IBM recently suggested to a potential customer the System 7 could be used to control a large internal telephone system.

Also, Philco-Ford is known to have offered a computerized PBX to users of the independent telephone companies, which would lease the system to users.

## Tester Simplifies Monitoring

"There are those regulators who would turn back the clock to the pre-Carterfone era and undo existing [interconnection] policies and tariffs," Strassburg charged.

The economic objections to present interconnection regulations include claims that the use of non-carrier equipment "benefits only the affluent [users]," Strassburg said. But this type of economic argument has been based "on prejudgments and conclusions generated more by emotion than logic and fact," he said.

"No responsible studies have been made or proposed to substantiate any of these shotgun assertions," Strassburg said.

NEWTON, Mass. — Users of Codex modems can utilize a low-cost test set to monitor the quality of their high-speed lines.

Called an eye pattern generator, the device displays the characteristics of a data line as an array of eight dots. The user can observe the changing shapes of the dots, or eye pattern, to determine the status of the line, Codex said.

The user can also monitor harmonic distortion, phase jitter, amplitude, hiss, white noise and phase hiss with the device.

As an example of the changes that can occur to the eye pattern, white noise would cause the eight dots to spread out, phase jitter would appear as arcs and harmonic distortion would cause ellipses on the screen, a spokesman said. The device can operate at 4,800 bit/sec and higher.

The dots in the eye pattern represent the four phases and two amplitudes associated with the signaling points of the modem, he said. The eye pattern generator converts the digital signal of the modem to an analog that can be detected by the oscilloscope, Codex said. Because it monitors multiple types of line imperfections, the test set replaces several separate meters normally used to monitor line characteristics.

The eye pattern generator is based on the "quadrature amplitude" modulation scheme used in Codex modems, and can be installed by the user, the company said.

The eye pattern generator costs \$450 and must be used with the user's oscilloscope. The device can be used on both analog and digital lines and does not interfere with data transmissions, the company said. The firm is at 15 Riverdale Ave., 02195.

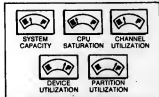


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2314 Compatible Disk File



Feature	CIGTROL Model 6730	IBM Controllers	
		Model 2314	Model 3830
2314 Compatible on 360 or 370	Yes	Yes	No
3330 Compatible on 360/65, 67, 75	Yes	No	No
3330 Compatible on 380/30, 40, and 50	Yes	No	No
<b>Price/Performance Features</b>			
■ Rotational Position Sensing	■ Command Chaining		
■ Multiple Requesting	■ Microprogramming		
ON IBM 360/65, 67, 75	Yes	No	No
ON IBM 370	Yes	No	Yes



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## Minicomputer-Based Systems Help Doctors Trace Isotopes

Two systems, one each from Digital Equipment Corp. and TC Systems, Inc., use minicomputers to aid the physician in determining the results of medical tests using radioactive substances.

The same principle is employed in both systems—a Gamma camera scans the patient to determine the flow of a radioactive isotope through a particular organ. The pattern detected by the camera is recorded using a matrix within the processor. This matrix is displayed on a CRT and can be stored for future reference by the physician.

The DEC Gamma-11 system is based on a 12K PDP-11/20 and uses a 1.2M-word disk drive to store the results of the tests. Also included in the system are paper tape reader/punch, clock, display and hardware to interface to the camera. The system can be expanded by the addition of tape drives, disks and communications equipment.

The DEC system can collect and digitize data in five different size matrices. Four matrices can be used to collect data in sequential frames, called a dynamic mode, and all five can be used to collect data in the static mode. List mode collection is also available.

Prices for the Gamma-11 system begin at \$50,000 including software.

The Scintillation Data System from TC Systems, Houston, uses magnetic tape as the primary storage medium for both static and dynamic images.

Two matrices are available, 32 by 32 and 64 by 64 data locations. Preprogrammed image rotation, oscilloscope display with recording cameras and a line printer are featured.

The line printer, an A.B. Dick Videojot, allows the production of "number pictures."

The system includes a General Automation SPC-16/50 minicomputer with 12K



DEC Gamma-11 shown with Gamma camera (foreground).

16-bit words of memory. Also included are a half-inch mag tape drive, Teletype ASR-33 terminal, CRT display and dual-buffered analog/digital converters. Prices start at \$42,000.

A satellite system that includes the A/D



Scintillation Data System stores data on magnetic tape.

converters and magnetic tape drives, allowing data to be recorded for processing at a central system is available for about \$15,000. Delivery of the Scintillation system takes 60 to 75 days from 3303 S. Rice Ave.

## Free-Cursor System Digitizes

ROCKVILLE, Md. — A "free cursor" digitizing system from Computer Equipment Corp. uses a minicomputer to perform a variety of control and processing functions.

Based on a 4K Data General Nova 1210, the Comp-U-Grid system can be provided with electronic grid digitizing surfaces in four sizes: 20 by 20-in., 30 by 36-in., 36 by 48-in. and 42 by 60-in. An electromagnetic coupler is used between the surface and the pen-like cursor.

The accuracy and resolution options open to the user are .001 in. resolution, 2.003 in. or .010 in. resolution 2.010 in.

Software provided with the system can handle most general-purpose digitized data processing, the company said. The routines include input and output formatting, error-correction routines, tilt and scale factors, shifts, rotation, interpolation (smoothing) length and area calculations, entry of supplemental coordinates and the capture of digitized history summaries.

Applications can either be written by the user in assembly language or by the company at extra cost, the firm said.

Slave rate of the digitizing system is 300 in./sec. Data can be recorded either a point at a time or as a series of points, the company said.

The standard readout device is a Teletype ASR-33 terminal. In addition, the system can be provided with any standard minicomputer peripheral including magnetic or paper tape, printer or CRT. An interface from the company allows a standard keyboard to be used to punch data into cards. Data rate is thus limited to 18 char./sec.

A variation of the system, Cadmac, offers interactive operation. A "menu" listing several operations is on the digitizing surface, with each operation preprogrammed by the user. The operator indicates the proper item with the cursor. An operation is then performed by the processor, with the output displayed on a CRT. The Cadmac unit includes a plotter allowing the contents of the CRT to be captured on the surface of the table.

Prices of the Comp-U-Grid systems begin at \$16,900. Delivery is 30 to 60 days from 14616 Southlawn Lane, 20850.

## Tektronix Interfaces Suitable for Terminals

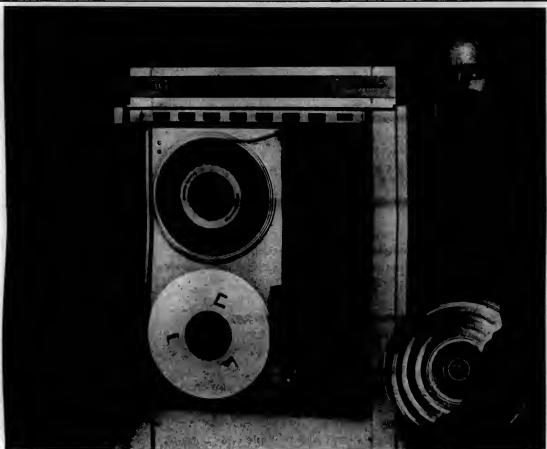
BEAVERTON, Ore. — Tektronix has a series of interfaces to enable its 4002A Graphic Computer Terminal and 4010 Computer Display Terminal family to be connected to a variety of minicomputers.

The computers include those manufactured by Digital Equipment Corp., Data General, Hewlett-Packard, Varian, Honeywell, Interdata and Raytheon.

The 4002A is an interactive graphic and alphanumeric CRT terminal equipped with a split screen including both storage and refreshed displays. It costs \$8,800 plus the interface which sells for \$300 when ordered with the terminals or \$600 field installed.

The 4010 system is a business-oriented CRT terminal with both alphanumeric and graphic capabilities and costs \$4,450 with interface.

Delivery is normally four to eight weeks from P.O. Box 500, 97005.



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These new members of the Mod 1100 family, with 25, 37.5 and 45 ips tape speeds, help meet your system requirements, without compromise, with the economy of packaging, interface and operator controls identical to those of WANGCO's 75 ips Mod 1175.

You can have transfer rates as high as 120,000 bytes per second, with densities up to 800 cpi NRZI and 1600 cpi phase encoded, with full IBM compatibility. If you're involved with COM, doing off-line printing, or using a

computer that requires transitions from NRZI to phase encoded formats, you can have dual-density 800/1600 cpi, switch selectable.

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FORMERLY WANG COMPUTER PRODUCTS, INC.



July 26, 1972

Supplement/Page 1

## Want an Independent Modem? Total System Approach is Best

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Modems have to be installed in pairs on data communication lines. And when the user selects his equipment he is confronted by a field of over 200 models from more than 50 vendors.

How then can anyone decide? As any data user knows, it's not easy, but there are some criteria to help narrow the field.

One of the major considerations requires a user to choose between a Bell or an independently supplied modem. The telephone company makes a point of reminding its customers that it supplies a complete communications service which includes a data set as an integral

unit. Bell is implying that the total package will work just a little bit better if the user stays with the phone company as his single supplier.

### Don't Get Caught

For many years data users invariably looked to Bell for their equipment. They were simply afraid to get caught dealing with independent vendors. But for all the predictions of impending phone company reprisals, many of which still circulate today among users, very few users can point to a degradation in service directly attributable to their dealing with independent vendors.

Most of the horror stories have not subsided and the phone company appears determined to meet the challenge of the independent modem makers with some new offerings.

Even when he decides to go independent, the user can't get far from the phone company standards. Most independent suppliers emphasize their Bell compatibility. A truly independent modem maker will announce his new device as "fully

compatible with the Western Electric 103 data set. But such a phrase may not be as all-encompassing as the user would like to believe.

"This word compatibility has been overextended," says Walt Straub, data set product manager at Ultratronics System Corp., a GTE affiliate. "A lot of users have been burned by selecting a compatible modem which turns out to have a small timing difference that can't be tolerated by the system. The relationship between carrier detect times, differences in the demodulation process—these things can 'blow your system's mind,'" Straub said. An independent Bell-compatible data set cannot always talk to another vendor's device, even though they both replace the same AT&T unit.

Admittedly it is difficult for the user to become familiar with a modem before he buys. The vendor of a data set that costs several hundred dollars cannot provide the prospective customer with the same type of benchmarks and specifications that support the sale of a CPU

- Supplier Support Essential
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costing several million dollars.

### How to Determine

But there are some basic steps the user can take to determine



Glen Arnold of Teletype Corp. shows potential customers how integrated modem fits inside a Model 35. The data sets are made by Teletype and are available to users.

whether a modem will fit into his communications network. After obtaining all available information about the modem from the vendor, the user should ask for a list of users with similar requirements who are operating similar networks. While this sounds rather basic, some straight talk with another user can often save a lot of headaches.

Three major points should be considered by the user, according to a technical source at International Communications Corp. (ICC). First the modem has to be "the most cost effective" for the job, he said.

In a peripheral-bound system capable of handling a maximum data rate of 3,600 bit/sec, there would be no point in installing a 4,800 or 9,600 bit/sec modem, the ICC spokesman said. In such a situation the modem would be "just half the time."

On the other hand, the same user should not try to get by with a 1,200 bit/sec data set which would be acting like a "constrainer" on a water pipe. A slower-than-required speed modem would be wasting time and line capacity all in the name of a small savings, he said.

When considering the right modem, the user should look at his total system, including central processor and I/O devices, rather than limiting his evaluation

### Satisfied User

Secondly, the user should be satisfied that the independent supplier can provide the needed maintenance and system support when problems arise. Although the equipment savings may be impressive with smaller vendors (over 20% compared with Bell rates), the company may not have a man available within an hour or two when problems arise.

One hedge open to the user is effective but more costly. This involves stocking enough spare parts or even an extra modem so that all but the most catastrophic failures can be overcome with little dependence on outside help.

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But the independents had no problem in accepting the knowledge of the user. Of course this also served their own purposes. The user that could troubleshoot his own system could often save the independent the cost of dispatching a service man. Whatever the reason, the user benefited by having greater control over his system.

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(Continued on Page 5/4)

## Identification-With-Bell Method Used In Grouping Four Classes of Modems

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Based on the identification-with-Bell method, Stephen H. Clark, director of marketing at Interline Inc., has defined four major classes.

Within the 300 bit/sec asynchronous class are Bell System 103A, 103F, 113A, 101C and equivalent independent modems using frequency shift keying (FSK) modulation for transmission up to 300 baud, Clark says. The most commonly used is the Bell 103A and the independent equivalents. Since the 103A can be used for full duplex transmission on 2-wire lines, the data signals are frequency division multiplexed.

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The two most important performance characteristics of 103-type modems are channel separation and receive level capability, Clark believes.

A general attitude seems to persist that "anyone can build a 103-type modem," Clark adds. Therefore, price should be the main criteria. But, price should

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Channel separation for 202C-compatible modems applies only for those units equipped with the low speed, 5 bit/sec reverse channel, since 202Cs operate half duplex (in the forward channel) on dial-up lines, he says.

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Specifications will generally be based on a simulated line since the variability of switched lines makes an error rate specification for switched lines virtually meaningless.

A properly designed modem which exhibits superior performance on a simulated line will generally perform better on an actual circuit, he maintains.

Clark emphasizes a number of operational features for the modem's ability to provide equivalent operation to the Bell 202C. These features relate primarily to the terminal-modem interface level, Data Terminal Ready (DTR) and various modes of operation that may be provided via front panel buttons or switches.

For example, the Bell 202C allows the user to have DTR "on" and prevent automatic answering, he says.

In making a modem evaluation, the user should review which modes of operation his application requires and verify that the modems being evaluated provide these capabilities, Clark believes. The Bell System 202D represents the 1,800 bit/sec synchronous private line class modem, Clark says. Most of the parameters for 202Cs apply to 202Ds with a small modification. Receive level capabilities need not be as wide since private lines do not attenuate the signal

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## On Choosing an Independent Modem... It All Comes Down to Price, Support

After all the factors affecting independent modem selection have been considered, the primary motivations for the data user are price and maintenance support.

"We bought 20 Bell 103 equivalent modems, and the units paid for themselves in less than a year," one user said. Asked how he determined which vendors he would consider, the user admitted to a rather unsophisticated approach. "We relied strictly on word of mouth from other users who had the

same needs."

Most users agree an independent modem should pay for itself in less than two years in order to be economically attractive. "You have to look at the payout period and try to anticipate whether any technological improvements can be expected during that time," one user said.

After a modem has paid for itself, based on a monthly payout level comparable to a Bell rental price, any additional service is strictly gravy. For those users who do only a minimum of

maintenance in-house, some support charges may continue. But most important is that the endless monthly rental for phone company data sets no longer has to be tolerated.

### Ability to Support

Many prospective customers of non-Bell data sets feel it is almost impossible to systematically evaluate the products of all suppliers. But one criterion that puts a vendor into active contention is the ability to provide service and support. "I want to

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Most of the independent suppliers encourage users to stock some spare parts. Many users keep enough circuit boards on hand to rebuild one complete modem if needed. But sooner or later the user will be faced with a maintenance situation that requires on-site help from the ven-

dor.

The modem supplier should have a user pinpoint his problem and solve it as quickly as possible. But often this will mean digging into the network beyond the operation of the data set. "Only about 10% to 15% of all network problems can be traced to the modem," according to a spokesman at International Communications Corp. (ICC). There is a tendency for people to blame a modem, he said.

"To the DP person, the modem represents the transition to the unknown world of the telephone lines. And to the phone company, when it does not supply the data set, the independent unit represents the transition to the unknown world of data processing," he noted.

When ICC maintenance personnel check the modem and find it functioning correctly, they will check other system equipment if the user agrees. "We don't want the user caught in a finger-pointing situation. Often the local telephone company man will not be able to find the problem and we will help," the ICC spokesman said.

But communications faults not caused by ICC modems can lead to a maintenance bill for the customer. The phone companies also reserve the right to charge a user for a trouble call when problems are traced to non-Bell equipment.

One vendor doesn't see these charges as holding back the user. "The user might get a bill of \$100 to troubleshoot his communications circuit. But the alternative of using his own trial-and-error approach could lead to 12 hours of downtime or more.

Such extended outages cannot be tolerated by most users and when allowed to occur, the lost productive time usually costs considerably more than the charge for the service," the vendor said.

# It's circa 1975 right now at Raytheon Data Systems.

The consolidation of Raytheon's extensive communications and data handling capability in RDS... provides a single source capable of offering a complete data processing/data communications system. Proven 700 series Computers, Programmable Terminals, Digital Microwave, Cable and Multiplex Systems are all under one roof.

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**RAYTHEON**

## WHAT NEXT FOR MCI?

On June 22, MCI Communications sold \$30 million worth of stock to the public. In addition, four banks agreed to lend the company another \$64 million. Thus MCI is geared to build its \$100 million specialized microwave communications network. How will MCI invest this money? Where are its program routes going? Who are its key officers? What's the background behind the development of this major new communications carrier? What was it that MCI told the FCC to convince it to approve its application? And just what are the prospects for MCI's stock price?

These questions are answered in the latest issue of DATACAST, a special 12-page edition entirely about MCI. This issue is available as a bonus to any order for 6 issues (trial subscription to DATACAST; the twice-monthly newsletter that concentrates on specialized Communication Carriers. DATACAST was introduced two years ago because it forecasts the arrival of new communications carriers. Now, it is the only continuing source of independent analysis of MCI, Datran, etc.

Receive the bonus issue on MCI and the trial subscription. Send your check for \$35 to: Paul Regan Associates, Inc., Dept. C-2, 2918 Sully Lane, Des Moines, IA 50319. Subscriptions are tax-deductible and may not be assigned without your consent.

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## EASE OF USE

## TASK/MASTER

?

Direct Interface With ALL High-Level Languages .....Yes  
Complete Operating System Independence .....Yes  
Single Interface With Monitor .....Yes  
Applications Independent of Terminal Type .....Yes  
Data Management for Multi-Threading .....Yes  
Special Background or Training Required .....No  
System Redefinition at Startup .....Yes  
Startup and Cycle-down Facilities .....Yes

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## EASE OF INSTALLATION

360/370, DOS/OS .....Yes  
Automatic Source-Level Customization .....Yes  
Application Test Facilities Including System TRACE .....Yes  
Response Time Simulator .....Yes  
Off-Line Application Testing .....Yes  
TP Access Method Independence .....Yes  
On-site Installation Support and Training (3 Weeks) .....Yes

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## FACILITIES

Supervisor Independent Multi-threading/Multi-tasking .....Yes  
Complete 'Warm Restart' Without Reprocessing .....Yes  
System Accounting Statistics for Files and Terminals .....Yes  
Simultaneous Record Update Protection .....Yes  
Dynamic Core Allocation .....Yes  
Overlapped Application Program Loading .....Yes  
Task Scheduling by Application Priority .....Yes  
Queueing of Read, Write and Unsolicited Messages .....Yes  
Centralized Access-Methods Support (DAM, SAM, ISAM) .....Yes  
Asynchronous (Spooling or Browning) Tasks .....Yes  
Message Switching Support .....Yes  
Optional Logging of Any Operation .....Yes  
Error Recovery from Application Failure .....Yes  
CPU Console or Terminal for System Control .....Yes  
Dynamic TP Network Redefinition .....Yes  
Password Protection .....Yes  
Complete File and Terminal I/O Overlap .....Yes  
Minimal Core Usage .....Yes

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## COSTS

Monthly Lease Charge .....\$500  
Purchase Price .....\$21,000  
Discount to Subsidiary Locations .....50%  
Term of Warranty (years) .....3  
Cost of System Updates .....0-  
'Starter' System Monthly Lease .....\$200

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the  
**TASK/MASTER:** a telecommunications monitor



**turnkey systems inc.**

one eleven east avenue, norwalk, connecticut 06851  
(203) 838-4581



July 26, 1972

Supplement/Page 1

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Carrier detect function is also important for a 202C-type modem, according to Clark. The user should be careful in reviewing carrier detect specifications because a few modems use a threshold-type detector which is not suitable for dial-up line applications, he cautions.

### Receiver Filtering

The most important characteristic of a 202C-type modem is the quality of the receiver filtering in terms of rejecting out-of-band noise and minimize the effects of amplitude and delay distortion, Clark says. This is measured by error

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Such extended outages cannot be tolerated by most users and when allowed to occur, the lost productive time usually costs considerably more than the charge for the service," the vendor said.

# It's circa 1975 right now at Raytheon data Systems.

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# Modem Improvements Seen Tied to DAA Regulations

While technological improvements for modems have been predicted for years, the chances of any being made available soon appear slim.

One of the biggest obstacles to the inclusion of new features in modems is the continuing indecision on the part of regulatory agencies from the FCC on down to the states. Until the FCC decides whether the Bell Data Access Arrangement (DAA) will remain as a permanent fixture, vendors will hesitate to radically alter their data sets.

## Specific Modem

It is possible that the FCC will in time eliminate the DAA requirements and substitute some form of equipment certification.

## Non-Bell Modems Spot Line Faults

(Continued from Page S11)  
Christmas trees, most are truly functional. And fault isolation is usually not as complicated as its name implies.

The usual approach to problems in a data line is very similar to the way the do-it-yourselfers used to troubleshoot their tube-type TV sets.

There are basically three elements that can be at fault when a data circuit hangs up or has intermittent problems. The cause can lie in the terminal, in one of the modems or in the line. And when the independent modem user pushes the button on his modem's test panel, he is looping back the line, or isolating possible offending elements in the circuit.

The analogy with the TV set is similar although there are some differences. While the tube in a TV set was replaced with a substitute, the communications element is simply switched out of the circuit to see whether it is causing the trouble. If test data can be transmitted when one device is eliminated, that unit may be causing the trouble.

While many independent data sets have fault isolation capabilities, the user cannot solve all his data troubles via these simple tests. Among the most difficult problems to pinpoint are the ones that occur in random or intermittent fashion. In such cases sophisticated test generators and line monitoring equipment are needed.

Nevertheless, the test features initiated by the independent suppliers have allowed the user to isolate (and sometimes solve) the problems in his system.

Evidence that Bell is becoming responsive to these diagnostics was included in the recent announcement of the new 208 data set. The 4,800 bit/sec unit features both analog and digital loop-back tests which are switch-selectable by the user at the front panel. In addition, indicators tell the operator when the carrier is present, when request-to-send or clear-to-send conditions exist, and when power is on.

While this type of diagnostics seems old hat to independent modem users and vendors, it may mean that Bell will finally allow its customers to perform tests previously reserved for its craftsmen and only the more sophisticated of its data users.

This would mean that a specific type of modem could be certified and approved for use on the telephone network.

Depending on the certification procedures, the modem may well become an integrated portion of the terminal to which it is now connected via cable and plug.

There are some low-speed terminals with built-in modems. IBM has for years included its private network line adapters inside such terminals as the 2741. And Teletype Corp. offers its teleprinters with built-in modems.

But the higher the modem

speed, the less chance there seems to be of bringing the data set into the terminal. Some users say they want discrete components in a network. This simplifies the isolation of malfunctioning equipment, these users add.

## Error Correction

Another valuable addition to data sets would be automatic error correction. Several firms have tried to market error-correcting modems for higher-speed operation only to find the end product was difficult to produce and expensive for the user to buy.

Some experts think error correction in a modem would do little to guard against the most common form of degradation in the data line.

When this happens, short periods are encountered during which the user may have very high error rates. It is not feasible to build expensive error-correcting methods into modems to overcome conditions that occur rather seldom and in a "burst" pattern, they argue.

One of the few vendors offering error-correcting data sets is Paradyne Corp. The firm has several modems that perform "error

control" functions at speeds of 4,800 bit/sec on both dialup and private lines.

Another development that would help prevent data line downtime is the programmable or "smart" modem. With this type of device attached to a malfunctioning line, the CPU would automatically switch terminals and modems onto a clear circuit with little or no loss of data.

With current modems, some users can manually switch to a backup line when trouble occurs. The smart modems would allow a switch to an alternate line to be done automatically.



## A lot of people have been making Digital has been

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**TDM Versus FDM****Multiplexing Costs Based on Volume and Distance**

Out of the nearly 700 DP users estimated to have data communications networks, only about 7% have multiplexers, according to a recent report by International Data Corp.

But more users are considering a multiplexer when it comes to optimizing their networks. "There's only one justification for multiplexing and that's saving money," said Lloyd Bond, president of Timeplex Inc., Norwood, N.J. "The user has to evaluate individual lines with individual modems and

compare them with single multiplexed lines and a single pair of modems," he added.

The crossover point at which a communications user should begin to consider multiplexing equipment is usually undefined. It is probably based in some combination on the number of miles and channels in a particular data network, according to Bond.

**Not Restricted**

"The more miles, the fewer channels are required in order to

make multiplexing feasible," Bond said. Contrary to other network designers, Bond does not feel that multiplexers are restricted only to the larger user. Even on a 100-mile system, the user can save on only two lines because he can get greater usage from the same facilities, Bond feels.

To understand the trade-offs involved, one must realize there are two types of multiplexing—the older Frequency Division Multiplexing (FDM) and the later Time Division Multiplexing

(TDM).

Multiplexers accept inputs from several distinct terminal sources, transmit the combined input over one telephone line, and at the other end a similar unit again separates the discrete data inputs.

An FDM unit combines the separate signals by slicing up the bandwidth of a voice-grade (or other) channel and allocating each separate signal to its own portion of the frequency band available. It is clear that a frequency band can be split just so

many ways and the number of FDM channels on any given type of line is limited.

The TDM approach is more flexible. Although it does not offer an unlimited number of derived channels, it provides increased flexibility by slicing up the available transmitting capability according to available time elements.

"The use of multiplexing is not a technological decision, it is an economic decision," he said. (Continued on Page 5/7)

**Modem Tied To Data Speeds**

(Continued from Page 1)

to the same extent as dial-up lines, he adds.

One difference between 202C- and 202D-type modems is transmission speed capabilities. Bell 202Ds operate at 1,200 bit/sec on Type 3002 unconditioned lines, 1,400 bit/sec on 3002 C1 conditioned lines and 1,800 bit/sec on 3002 C2 conditioned lines.

**2,400 Bit/Sec Synchronous**

The 2,400 bit/sec synchronous modem is represented by the Bell 201A (2000 bit/sec on dial-up lines) and the Bell 201B (2400 bit/sec on C2 conditioned private lines).

For this modem, the user must be aware that different modulation schemes are used by various suppliers. This is not the case in 300 bit/sec and 1,200 bit/sec type modems where FSK is the only modulation scheme used.

For 2,400 bit/sec modems, there are three schemes most frequently used: vestigial side band (VSB) modulation, duobinary FSK modulation and differential phase shift keying (DFSK) modulation, Clark says.

Above 2,400 bit/sec there are no industry standards such as Bell provides for lower-speed operation. As a result, modulation schemes vary between suppliers.

This type of modem contains one of two types of equalizer: manual or automatic adaptive. Manual equalizers are implemented as "eye pattern" adjustments which tend to be qualitative at best, or as adjustments measured by meter reading with meter adjustments preferable due to ease of adjustment.

One measure of the quality of automatic adaptive equalizers is initial set up time. In high-speed modems today, this time varies from 100 msec to 10 sec, Clark states. Obviously, a unit that can set up in the shorter time, and operate with the same error rate as a unit with slower set up time, contains a better equalizer, he adds.

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## Multiplexers Can Cut Line Costs

(Continued from Page S15)

economic decision," according to James Corliss, Data Pak marketing manager at Data Products. If a user has few drop-offs with basically a point-to-point network, then with a number of high-speed channels he has a natural TDM operation, Corliss said.

Most FDM capability is "in the aggregate of 1,800 to 2,400 bit/sec," total capacity on a three kHz voice band, Corliss said. If the user wants to generate 2,400 bit/sec data, he really doesn't want to use FDM, he added. For example, a user running a high-speed CRT at 2,400 bit/sec should use TDM instead of FDM. But with two CRTs running at 600 bit/sec and five low-speed TTYs at 75 bit/sec, then economically he is better off with FDM, Corliss explained.

Multi-drop is best for FDM, and that is where the economics really come into play," Corliss said. In networks with low-speed terminals, geographically distributed and less than eight to sixteen channels, the user should first think of FDM. Lloyd Bond does not see such clear-cut distinctions between TDM and FDM technology. Although he readily agrees the choice is tied to the total costs per channel for the user, Bond sees exceptions to every "rule." Timeplex was one of the first suppliers to challenge the established concept that TDM has to be more expensive on a per channel basis than FDM, he noted.

"Every FDM channel except for the power supply is a complete piece of equipment," Bond said. And even the least expensive systems such as those from Larkurt will cost the user about \$350, per end per channel, he stated.

### 'Common Logic'

In contrast, TDM systems use a set of "common logic" which is "reasonably expensive" but still more economical in the long run. "A 4-channel system from Timeplex costs \$855. And if the user divides that by four, he comes down to \$213.75/channel. And the actual channel modules are only \$115 each, so at \$340 the user is just about at the break-even price in a point-to-point 4-channel system," Bond said.

But Bond concedes that in certain cases FDM has no viable alternative. "The only time FDM makes sense is when the user has a single terminal at each location in his network. In this case there is no opportunity for the user to share the common logic of a TDM among several channels," he went on. But the minute the user gets more than one terminal at each location, TDM becomes "very favorable" compared with FDM.

Actually, the choice of multiplexing is part of an overall network configuration problem many users find difficult to face. Data Products Corp. believes a network design program is the only effective way to optimize a user's network.

As part of its "sales pitch" the company offers the Data Plan package to give the user a complete cost analysis of several network alternatives. Described as a "topological mapping," the package provides an analysis based on number of nodes, cost/mile, type of multiplexing and other variables that can be incorporated into the data network.

While most suppliers of multiplexers (and other data equipment) recognize the relationship between the equipment and the lines, Data Plan links the two in a complete package. And most vendors, if they are objective, must consider the user's network configuration in order to recommend the best equipment for the job.

Significantly, few users go directly into a multiplexing scheme. Most operate their network for some time and then consider multiplexing as a kind of second-generation economy measure.

### Paying Too Much

"Many companies are beginning to realize that they are paying too much for their communications networks," according to Terry Weaver, sales manager at Digital Systems Corp. The firm specializes in analyzing the efficiency of projected and existing telecommunications networks. Much of the network optimization is done by a special software system called Netset.

The Dartmouth Time Sharing System gradually evolved from serving first a few

### Multiplexers

Many remote terminals or circuits, each of which requires its own channel to the CPU

#### Frequency Division

Each channel has its own "data set" pair; guard bands between channels waste bandwidth so FDM provides fewer channels; less costly for widely dispersed terminals; less costly for few channels.

#### Time Division

One data set pair; very efficient use of bandwidth and provides more channels.

### Concentrators

Many remote terminals or circuits no one of which requires its own channel to the CPU

#### Store and Forward

Incoming messages accepted (to buffer limits) even if output channel is busy. More costly.

#### Contention

Incoming messages declined if output channel is busy. Cheaper but lower in service.

The major differences between multiplexers and concentrators are shown in this chart from Bargland Associates, a communications consulting firm.

schools to many spread over a multistate unit. In 1969 when line costs began to become prohibitive, the school asked Digital Systems Corp. to analyze the network and suggest an economic reconfig-

ure. Digital Systems applied its Netset program to the task and the results are considered by many as a classic case (Continued on Page S11)



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## More Functions to Front End Smart Users 'Deemphasize' Host

With the increasing complexity of computer communications systems, the use of separate front-end processors to assume the communications control is on the rise.

The front-end or programmable communications processor has been around for some time. The first innovators with this type of device were probably the time-sharers who realized relatively early that the main CPU or "host" computer should be reserved for manipulating data and not controlling communications inputs.

"Users want to remove all the communications overhead from their host computer," noted Herb Rikelman, marketing manager of communications at Computer Communications Inc., Culver City, Calif. While many have defined the capabilities of the front-end processor in various ways, Rikelman has his own description.

"When multiple communications lines are coming into a central DP site, the user has to serve those lines. There may be hundreds of lines, all operating at different speeds, and bits are being transmitted in various formats. And the system has to do parity checking and it has to

assemble bits into characters, and characters into messages.

"These types of functions deal strictly with communications and they have to be handled before the data gets into the main CPU."

While all this sounds a bit hectic, it is exactly the type of operations normally handled by a front-end processor.

For the teleprocessing user the communications front end offers some real advantages and cost savings. "The use of a front end can result in great savings in system cost by removing certain functions from the host computer," according to Jon Gould, director of data communications at Interdata Inc. The savings include longer system life achieved by reducing the main CPU memory previously dedicated to communications and this in turn helps increase throughput capability, Gould added.

While the various functions of a front-end processor have often been described, a recent report by the Datapro Research Corp. seems to be among the most complete.

Datapro lists the following 10 functions:

- Line control, which includes the polling of terminals, auto-

matic call answering, etc.

- Character and message assembly, which includes the formatting of messages for compatibility with the requirements of the mainframe.

- Data conversion into the "native machine code" of the host CPU.

- Data and message editing, which includes data compression and other restructuring schemes for faster transmission.

- Error control to keep incomplete messages from reaching the main processor.

- Message buffering and queuing to allow data to be fed to the host CPU at a compatible rate.

- Message switching, which becomes important when a front end is connected to several mainframes.

- Message answering including simple reply which do not have to tie up the host system.

- Message recording which becomes important when a network failure occurs.

- Statistics recording which includes keeping a record of traffic, errors and other housekeeping functions.

Any and sometimes all of these functions can be assumed by the front-end processor depending

on size, configuration and the many other parameters in a data network.

And if the functions of a front-end processor seem almost unlimited, the applications where they can improve network efficiency are also varied. Among the possibilities are the replacement of an existing hard-wired communications controller such as the IBM 270X type, or the configuration of a front end in the initial design of a communications network.

To users familiar with the independent peripheral environment, the 270X replacement will sound like the same approach.

To some degree this is correct, but there are major differences. The peripherals are usually plug-together compatible with little impact on the mainframe's operation. But the 270X replacements can give the user a "gift" of valuable CPU main memory in many cases. How is this possible?

The IBM 360/370 systems use 270X hardware in conjunction with software "access methods." These include the familiar Blam, Qam, Tcam, etc., which must be run in main memory since the 270X controllers have no large-scale memory of their own. And

(Continued on Page S113)

## 3705 Has Its Limits

With the introduction of the IBM 3705, independent suppliers now feel the mainframe has given its stamp of approval to the concept which they considered. But the independents are quick to caution the user that the 3705, with its presently available features, has some limitations that can best be overcome by independent front-end systems.

"IBM is now supporting the idea of taking the processing load off the mainframe with their introduction of the 3705," says Daniel Sinnott, president of Interdata Inc. "We are looking forward to the follow-on systems built around a satellite computer. With that impetus we will see a lot more of this type of system. The tasks previously relegated to the host computer have been ridiculous in terms of its fundamental power," he said.

The tasks Sinnott referred to were related to the IBM 270X hardwired controllers which used up core in the mainframe. With its 3705 IBM followed the independents in their efforts to move the communications processing out into a front-end minicomputer.

"But there are a lot of limitations to the 3705," Herb Rikelman of Computer Communications Inc. feels. As a prime example, the 3705 will not support 300 bit/sec terminal devices, he added.

"I agree that the system has some limitations but there is a good reason for each," Phil Cleveland of Tempo Computer Inc. stated. "IBM can't support 300 bit/sec terminals with the 3705, except on an RPO, simply because there aren't any IBM terminals that operate at that speed," he noted.

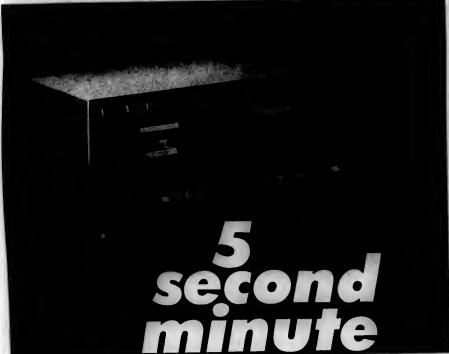
But the 3705 limitations go deeper than just transmitting speed, Cleveland said. Many independent terminals use different codes, communications procedures and terminal functions, he pointed out.

"Here the user is getting into areas that IBM has difficulty supporting. Things like polling techniques for CRTs, special display cursor controls for graphics applications or new asymmetrical (dual speed) data rates are the type of features that the 3705 can't support, he said.

Cleveland defines this application as a stored collection of messages using slower-speed Selectric-type devices as opposed to the higher-speed intelligent terminals. And any type of front-end application where the processor requires interfacing with CPU peripheral such as a tape, disk, drum, card reader or line printer, is not available to the 3705 user, according to Cleveland.

While the independents concede it is well within IBM's capabilities to rectify the current limitations of the 3705, they feel they still have the edge.

"We find that the majority of communications users still have special problems that require custom software support. This type of service will always be difficult for IBM to supply," related one supplier of programmable front ends, "and this is where we already have extensive experience in supporting the communications user."



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## Multiplexers Can Cut Net Costs

Continued from Page 5/7

study for multiplexing. Based on the Net-net analysis, and the installation of FDM multiplexers made by Northern Radio and supplied by Ultronic Corp., the Kiewit Computation Center saved about \$9,000/mo or more than \$100,000/yr by multiplexing its lines. Even if the cost of the FDM equipment is subtracted from the line savings, the case for multiplexing becomes very conclusive.

### No Flexibility

Significantly, Dartmouth had been the Bell Labs test site for the Datex service to be offered later by Bell. The Datex service, later renamed Data Line Concentrator Service, did not give Dartmouth the flexibility it could get by buying its multiplexers and writing them off. Some of the Datex features offered during the test period were not included when the service was tariffed, according to Thomas Byrne, assistant director at Kiewit.

Today the Dartmouth system includes more than 300 terminals, mostly of the teletypewriter class, which the school owns and maintains with its own staff. Although some equipment at outlying sites is serviced by third-party maintenance firms, the combination of purchased terminals and multiplexing has given the Kiewit center "fantastic" yearly savings on its operation. About 60 terminals are connected to the network via multiplexers.

It is now three years since the initial Netnet study, and the school has asked Digital Systems to take another look at the time-sharing network to determine whether additional savings are possible, Byrne said.

Timeplex encourages the use of TDM equipment based on its transmitting scheme which it calls characterplexing. The key to characterplexing is the elimination of start and stop bits from the data transmission, according to Lloyd Bond. "If you know where the character starts and stops, you can 'artificially re-introduce' the dropped bits on the receiving end," Bond said.

### 20% Savings

On transmission at 150 or 300 bit/sec, Bond said, the characterplexing method can delete "two bits out of every 10" with a 20% savings in transmitted throughput.

The transmission method is similar to the data compression used by other vendors such as Tally and Data 100, Bond said. He sees an additional benefit in the Timeplex method because "we sample the data signal and can accept TDM

signals which are "time distorted by as much as 45%."

Signals with this distortion can be re-transmitted with less than 1% distortion, he added. The Timeplexer T-16 is priced at about \$3,000 with modem or about \$180/channel for a 16-channel system, Bond said. A comparable all-Bell system with individual modems on each channel would cost about \$350/channel, he estimated.

One of the recent developments is a change in AT&T tariffs that will allow multiplexing on wideband private lines. Computer Transmission Corp. has a system that will multiplex any number of synchronous and asynchronous terminals with any combination of data rates up to a maximum total throughput of 2 million bit/sec. For users, the wideband tariff will allow the operation of low, medium- and high-speed terminals simultaneously over a single high-capacity line. But users must have enough data traffic in their system to warrant the higher line costs of wideband facilities.

## Most 'Concentrators' Really Front Ends

While the term concentrator is often used when referring to data communications equipment, most of the definitions are incorrect. Many definitions include a computer-controlled device which does not fit within the telephone meaning of concentrator, according to one expert.

"A concentrator differs from a multiplexer because it introduces the element of contention into a system," said Lloyd Bond of Timeplex Inc. A concentrator takes 10 terminals and allows any six of them to transmit their data over the six available lines, Bond said.

The seventh terminal to contend for the facility will get "bused out," while in a multiplexed system all 10 terminals can be accommodated. "With a multiplexer system we assume every terminal is 100% used," he noted.

The savings with a multiplexer are based on combining the data while the savings in a concentrator are based on the amount of traffic in the system. In effect, the concentrator "hedges" that all of the terminals will not be in contention for the available facilities at any one time.

Perhaps the best example of a true concentrator is the switched telephone network. While theoretically all subscribers can access all other subscribers, the system is configured to expect that this situation will never happen at the same time.

In effect, the subscribers using the system access the available lines on a first-come, first-served basis. A concentrator handles data terminals on the same type of priority sequence.

The devices which operate under computer control are more properly called front-end processors. They should not be confused with concentrators.

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### About the Author

This special report was prepared by CW Technical News Editor Ronald A. Frank, who has been responsible for communications coverage since 1969.

Frank has been associated with computer communications systems for more than 10 years, including military data systems. He has been a consultant on computer-related communications problems and has extensive technical writing experience relating to EDP and data communications systems. He is a member of the IEEE.

Ron Frank



# Minicomputer as Network Front End Signaling New Dispersion of Power

While today's front-end processors offer significant advantages to the communications user, many users feel the real potential of this device has not yet been realized.

"The functions of the front-end processor will become more complex, their price will go down because of increased utilization and the decreasing price of the minicomputer," according to Max Beere, director of telecommunications systems at Tymshare Inc.

The dispersion of computer power is just beginning, Beere believes. "The mainframes are becoming less sophisticated and doing bulk types of processing," he said.

One of the most significant trends in the evolution of front-end processors is the custom modification of minicomputers to perform specialized communications tasks, Beere noted. The mini that can handle 100 terminals designed on the basis of traffic demand rather than the number of devices is the front end of tomorrow, Beere thinks.

While today only the more sophisticated communications users are modifying their minicomputers, Beere believes the approach will become more widespread. Tymshare has reconfigured the Varian 620 mini into a network front-end device used in the firm's Tymnet communications system.

Called a Tymnet, the mini performs communications functions including the control of remote terminals. (Some have referred to this type of control as intelligent multiplexing.)

For innovative users, Tymshare will sell the Tymnet mini for communications networks. Explaining the changes to the basic 620 design, Beere said: "We put a synchronous front end on the mini which allows us to interface eight simultaneous lines each up to 9,600 bit/sec. And all this is included on one logic card, he added.

"You lose the definition of what a front end is and what a multiplexer is when you look at this type of device," he noted. While it acts as a front end to the main CPU, the Tymnet becomes a terminal controller when seen from the other end, he stated. The modified mini can also act as a message-switching device and a line switch, he said.

The Tymnet is "a different breed of cat," and although it is available to users, few have yet indicated an interest because of its advanced concepts, he admitted. A Tymnet would cost about \$40,000 to \$50,000 depending on configuration, Beere estimated, and this would include full systems support.

While the Tymnet does not have many interested users today (Beere thinks it is still several years off), the modified 620 is already an integral part of the Tymnet system. Asked if the Tymnet configuration was patterned after any similar devices, Beere said it applied many of the principles of the mini-switchers used in the Advanced Research Projects Agency (Arpa) network.

Beere carries the Tymnet concept one step further to apply to the subsector of tomorrow's time-sharing or computer utility networks. He foresees the user configuring a complete network subsystem or node of terminals controlled by one mini which in turn will interconnect with a larger computer resource network.

"I think we will see a tremendously accelerating trend in the use of minicomputers as front ends to networks or front ends to host computers. And I think we will see a gradual decrease in the main host CPU concept," he said.

There are those who agree with Beere that the flexibility of multiple minis used in networks will provide greater advantages than the single larger mainframe. The new uses in communications-oriented minis will lead the way to the much-

heralded distributed data processing configurations, Beere said.

One communications veteran who agrees on the importance of the mini as a front end is Dan Zatyko, director of data communications at Varian Data Systems. "Probably the granddaddy of the front-end processors was the Datnet 30 which was used in early time-sharing systems such as the Dartmouth network," Zatyko said.

Although the use of the mini as a front end is important, Zatyko sees the front-end function being divided into several subfunctions - "we will see more and more multiple front-end processor systems in the future."

The dual front end gives the user a "full soft" capability, Zatyko noted. He explained that a dispersal of front-end responsibilities will make it much more unlikely for the user to lose his entire communications function in the event of

a system failure.

The biggest advantage of the multi-mini concept is the flexibility of the user to adapt to a changing communications environment, Zatyko added. He believes that dual processor front-end systems will efficiently operate with shared memories similar to the concept of the Varian V73 system. The recently announced Varian mini has a multiple bus memory system similar to the DEC PDP-11.

"We plan to take over not only communications functions but also DP operations in the outboard processor," said Phil Cleveland of Tempo Computers Inc. Repetitive functions such as print operations and sort/merge routines are inefficient in the mainframe and should be moved out to the mini, Cleveland feels.

"Users should be able to move 'complete functional software assemblies' out into the satellite processor and run such

"I think we will see a tremendously accelerating trend in the use of minicomputers as front ends to networks or front ends to host computers" - Max Beere.

DP operations concurrently with their teleprocessing programs. The outboard processors certainly have the horsepower, the capabilities and the savings to the user in machine cycles and core to assume more and more of the processing load, Cleveland believes.

The minicomputer in combination with communications processing will also help to bring applications, now separated, closer together. "There will be a marriage in the area of industrial control with data communications," according to Daniel Sinnott, president of Interdata Inc.

Monitoring equipment will be installed at remote locations and transmitted to central site mainframes with communications front ends combining the data for input to the main CPU, Sinnott predicted. These systems will have a "hierarchical structure" with large amounts of data communications processing.



# Users Save by Giving More Functions to Front End

(Continued from Page 5/10)

"large scale" is the correct description, for one of the access methods can use from 30K to 50K or more valuable native mainframe core depending on the size of the system.

The independent suppliers disagree on the value of 270X replacement equipment operating in a mode that emulates the IBM hardware. "The emulation approach gives the user a 'security blanket' so he doesn't have to drastically change his communication software organization," stated Phil Cleveland, manager of systems marketing at Tempo Computers Inc., Fullerton, Calif.

With pure emulation there are no changes in the mainframe so there are no savings in processing time or core storage, Cleveland said. "But when the user breaks out of the emulation mode and with the proper software, he can take portions of his operating system that are resident in 360/370 core and move them out into the front-end processor. Such functions as polling and error-correction routines

can be moved out," Cleveland said.

While the IBM access methods will not support independent terminals "without extensive software changes," the front-end processor does allow the user to utilize this type of device if the front-end "absorbs" the software differences, Cleveland said.

But some vendors see even stronger advantages with independent front-end in emulation mode. "We have used the IBM access method to deal with the independent terminal and we have put the extended features of the terminal into the data," Interdata's Gould explained.

As an example, Gould cites a CRT feature that can be identified in the data sent from the 360 as opposed to the access method. In such a case the user is still working in emulation mode with the IBM access method, but an "extra character or two has been added" to the data developed by his application program.

And this additional software capability is included with front-end processors of the type supplied by Interdata, Gould

said. "The IBM access method and the mainframe are still in operation but we have just 'fooled it a little,'" Gould added. The capabilities here are limited only by the features included in the independent terminal equipment, he said.

Another advantage of an independent 270X replacement unit would be in the area of time-dividing multiplexers, Gould said. The independent front end could perform the demultiplexing functions, thereby eliminating the half of the TDM equipment in a network that is installed at the central site. This could be accomplished while the system continues to run in emulation mode, he explained. But regardless of any advantages in emulation mode, the independent suppliers agree the real savings come to the user who moves his communications functions out of the mainframe and into the front-end processor.

"In a 100-terminal system if the user replaces his IBM 2703 and goes to a 2700T system from Tempo, the savings could be from \$2,000 to \$5,000," according

to Phil Cleveland. And if this user were running his system on a 360/50, the savings in core, freed by removing the access method code, could allow a planned mainframe upgrade to a 360/65 or even a 370/155, he added.

The release of mainframe core, when the IBM access method is dumped in favor of the independent front end can be significant. "Typically the user can cut access method software residency requirements by three to four times, depending on how he programs the front end and how many functions are moved out of the mainframe," Cleveland said.

While Barm can typically consume about 10K bytes, Qam or Team with their more sophisticated approaches can eat up from 75K to 200K bytes, he estimated. The savings in core storage is a function of the number of communications lines supported in the network.

The user planning to expand his teleprocessing system is advised to consult with his IBM representative to add a larger mainframe. The independent felt they have an important alternative to this approach. And they can offer substantial savings.

An interesting additional benefit to the front-end processor approach is that later memory expansions are less costly. "As a general rule it is cheaper to add memory to a programmable front end than it is to add core to the mainframe," Cleveland explained. "Typically, Tempo core storage is half the price of IBM mainframe core," he said.

An unusual approach to the IBM front-end system was introduced recently by Digital Equipment Corp. The mini maker has chosen the IBM Graphics Access Method (GAM) as a vehicle for its emulation scheme. Called the DEC 11D23, the system uses the familiar PDP-11/20 and a hardware interface, the DX11-B, which connects to the multiplexer channel on a 360/370 or the selector channel on a 360.

"The typical user for our front-end approach is either out of line addressing capability on his 360 or he has run out of mainframe core on his Model 50 or 65," noted Dave Stackpole, product manager for the 11D23 system.

"This type of user needs to move his network control out to the front end to relieve the pressure on his mainframe, Stackpole said.

With GAM and its limited mainframe core requirement of 5K bytes, the user is less vulnerable to software changes since the front end acts like a hardware controller, Stackpole said.

## Not Limited to Decives

The initial DEC system emulates the 2848 CRT controller but can also emulate hardware emulators including the 3705 will be available, he said. "People think of GAM as talking to a display, but actually all that is in the application program. The access method is not limited to display devices, but the user's software will have to be changed. And if he goes to GAM he is not limited to one type of device, Stackpole said.

"The user can pass a data buffer from the applications software written on the 360, to the DEC network control program in the PDP-11. One part of the software tells him where to send the data and the other part is the actual data," he said.

The intelligent software that knows how to make various types of terminal devices respond is now resident in the front end, Stackpole said. "A pure 2703 emulator doesn't provide this flexibility. All it provides is physical control to the line and the full format of the data is just passed on to the 360," he said.

Since the hardware interface is programmable, it can be made to respond to virtually any peripheral on the 360 channel, Stackpole said. The DEC interface can also be programmed to look like a 2703 if "a user really wants to do this type of emulation," he remarked.

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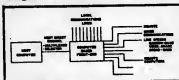
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## Front-End Configurations Based On User's Mainframe Applications

The best way to classify front-end processor systems is by the interface methods with the host computer, according to Jon Gould, director of data communications at Interdata Inc. There are basically five ways to connect a front-end processor to a mainframe and the interfacing involves both software and electro-mechanical considerations, Gould noted. One approach to communications interfacing is to emulate an existing device in the host computer. With the appropriate software packages in the communications processor, independent terminals can be supported without modification to the host CPU communications support programs, Gould said.

### Plug-for-Plug Replacements

The plug-for-plug replacement system connects physically and electrically to the standard host computer channel as though it were a standard peripheral. The



### Plug-Compatible Front End

front-end processor emulates a well-defined subset of the device it is replacing, Gould said.

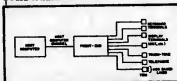
The advantages to this approach are dollar savings without modifying the host software. For equivalent configurations of 128 terminals there could be savings of \$40,000 to \$100,000 when replacing an IBM 2703 control unit with a minicomputer-based equivalent system, Gould said.

The value of the plug-compatible front

end becomes much more important if the user takes advantage of its power to perform some of the functions that might otherwise be done by the host. For example, the front-end might perform code conversion, character-to-message assembly, error control, line usage and statistical journaling, Gould stated.

With such techniques, it is estimated host CPU and core usage can be cut as much as 50%. In many cases, response times can be improved since less manipulation (drum access, etc.) would be required by the host computer.

The major advantage to the use of a plug-compatible processor is in its flexibility and resulting system cost savings. The programmable nature of the front end allows the direct connection of asymmetrical TDMA's, thus reducing the number of adapters and leaving the TDM cost, Gould estimated.



### Plug-Compatible Processor With TDMs

In this case, the front end performs the demultiplexing function directly from the multiplexed medium-speed port. The system also allows connection of devices which would not normally be supported by the host hardware or software.

For example, computer-based message concentrators, non-compatible host computers, non-supported terminals and TDM equipment can all be made acceptable to the host computer complex by appropriate front-end software, Gould said.

(Continued on Page S15)

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## But TTYs Still Plentiful

# Need for Faster Terminals Leads Users to CRTs

For years the data communications user has thought of the teletypewriter first when selecting his terminal equipment. And there are still more TTYs installed than any other type of terminal. But as users expand their terminal requirements from the basic 10 char./sec. electromechanical machine, more options are growing.

The initial attempts at teleprinter upgrades have been little more than mirror images of a teletypewriter, operating at higher speed or with added features.

### Still the Same

More recently magnetic tape, upper and lower case characters and faster speeds have been added to the teletypewriter. The product has been tailored more toward the needs of the data user, but despite the bells and whistles, it is still the same TTY.

"As long as a user can get a Model 33 ASR with paper tape for about \$1,000, there is a big roadblock for suppliers of other equipment," is how one vendor put it. The reference to cost is not to be overlooked. The major reasons users stay with teletypewriters is that they are low cost, relatively simple to operate and relatively reliable.

This is a difficult environment for users to leave. In some ways it is symptomatic of the entire data communications area. While there is equipment that can operate at 9,600 bit/sec and buffered terminals with vast storage capacity can be purchased, the user can only justify higher price equipment if his network moves enough data to warrant a shift to higher data speeds.

There are, of course, exceptions. The more sophisticated users such as insurance companies have long been operating

nationalwide networks, many with remote batch terminals polled automatically by central CPUs during non-business hours. These are high-speed systems that often tax the phone facilities they are using.

But the average data user is not an insurance company. He may have to keep track of 100 sales nationwide in a day, instead of updating 10,000 active insurance accounts each night.

To the smaller user speed is important. He has learned that to rely on the mail system for overnight or even two-day delivery is an invitation to operational suicide. This small user knows he must justify the throughput in his data network before he can go to more sophisticated equipment.

### Efficiency the Word

But despite the price, many users are selecting faster, more versatile terminals

and many are making the equipment pay for itself. Usually this means replacing people-dependent applications with more efficient equipment.

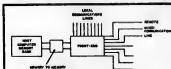
The department store CRT credit validation system pays for itself by making the individual operator more efficient, and spotting bad credit accounts that previously slipped through manual procedures. The manufacturer that now writes shipping invoices at remote sites with intelligent terminals eliminates long error-prone phone calls that were required to instruct the operator on printing the proper information.

"In the area of TTY upgrades, the 30 char./sec. terminals offer some real advantages." [Continued on Page 16]

## Front-End Users Tied to Mainframe Applications

(Continued from Page 5/14)

A core-to-core front-end system is generally reserved for larger systems where fast core cycle time transfer speeds are required. This same approach is used for

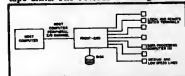


Core-to-core system supports high speeds, connecting low-speed peripherals such as card readers and line printers to a high-speed processor.

This method is generally restricted to computers of the same manufacturer since they are direct memory interfaces. Gould noted. In cases where the machines are from different manufacturers, there is generally a substantial black-box engineering requirement for matching internal format and signaling requirements, he added. This type of system should be more than 500 to 1,000 feet from the memory of the host computer, Gould believes.

This approach includes a pseudo-device interface wherein the software of the communications front end imitates the operations of a standard peripheral device such as a magnetic tape, disk or drum subsystem.

The pseudo-device approach has the communications front end responding to the host computer as a series of magnetic tape units. The obvious advantage is the

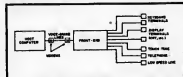


Front end imitates I/O peripheral.

of software compatibility. This approach becomes more and more attractive when coupled with a host that has a sophisticated operating system, Gould said. These operating systems are generally provided with standard peripheral access methods that allow applications programs to communicate with a wide variety of peripheral devices in a standardized way, and it is desirable to use these methods without modification.

### Data Link

The use of a data communications link between the host CPU and the front end is illustrated below.



### Data Link Processor Connection

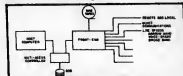
In general, the data link will be accomplished through common-carrier facilities using modems and other communications hardware to effect the connection, Gould said. In certain cases, when the front end and the host are in the same room (approximately 1,000 feet from each other), both the front end and host limited distance line adapters may be used in place of the normal communications carrier link. This is generally less expensive and improves the overall system reliability, Gould added.

The data link approach is probably the "cleanest" interface between multi-computer systems, especially where several manufacturers are involved, Gould believes. The connection generally involves standard off-the-shelf data communications interfaces from each vendor. At the same time, the data link method is probably the most expensive since it in-

volves communications equipment at all ports and probably a good deal of redundancy, Gould explained.

### Inter-Computer Peripherals

The inter-computer peripherals method refers to the use of a multi-access, random storage device such as disk or drum for transferring ring data from the front end to the host computer.



### Intermediate Storage Configuration

More recently, this method has been used with IBM large core storage (LCS) as the intermediate storage device, when the same vendor was supplying the front end and the mainframe, Gould said.

Multi-access methods are generally configured in one of two ways.

The storage device is dual-accessed and is the only connection between the processors. Each system interrogates fixed control areas on the device for information transfer instructions, or a high-speed processor-to-processor interrupt line is added to provide the inter-computer instructions and command path, Gould said.

Some of the advantages of this type of system are the elimination of redundant storage, since either system can recover from the file. The system can achieve very high transfer rates when data is available, and it can be supported by standard operating system software.

There are probably hundreds of different variables to front-end systems, Gould noted, but he believes they are based on one of these five approaches.

The Modcomp III communications processor from Modular Computer Systems includes microprogrammed firmware for formatting and error checking.

## User Writes Programs

One company with a different approach to the communications processor system is Modular Computer Systems, Fort Lauderdale, Fla. "We are concentrating on applications where the user wants to buy the communications hardware and develop his own software," according to William L. Arbuckle, director of technical marketing.

A big advantage of the firm's communications front end is the read-only memory that lets the user microprogram special instructions for teleprocessing messages. "This year we have extended the instruction set of the Modcomp III to include a message-processing macroinstruction with options such as testing of special characters and redundancy checks," Arbuckle said.

And because the company supplies mainly communications hardware, the user can get a lower-cost processor if he has the necessary capability to program the CPU. An entry-level system with 4K words and "all of the communications instruction extensions" for the Modcomp III costs about \$14,500, Arbuckle said.

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# Users Must Consider Dial-Up and Private Lines

For many users, designing a data network involves complex trade-offs. One set of considerations involves the choice of private lines versus dial-up facilities.

There are a number of factors to consider in deciding. The operating characteristics and traffic patterns of the user's communications will usually point him in the right direction.

For most consideration is cost. While private line rates are usually based on mileage from end to end, long distance dial-up costs are figured on a per-minute message unit basis depending on often complicated tariffs. And some dial-up services such as Wats can help to reduce costs for users.

An additional economic factor may soon become important if AT&T modifies its private line bulk rates as predicted by some observers. These AT&T rates for high-volume private line users are now higher in the major metropolitan areas. But the Bell System apparently is con-

sidering a shift that would make less populated areas, near large cities, higher priced for private line users.

The economic trade-offs often require the assistance of a communications consultant to find the lowest cost method.

Probably the most important factors in choosing between private or dial-up lines are related to throughput and geography. "If the user doesn't transmit data to and from fixed points, then dial-up lines must be used," according to Dixon Doll, a communications consultant.

"In a system with a broadly mixed basis with dispersion in both geographic area and terminal population, the user probably has to use dial-up lines," Doll said.

But dial-up lines also have disadvantages. In networks where response time is important, the 15- to 20-second connect time can be prohibitive, Doll noted. In airline reservation systems or business systems where transactions have to be

processed immediately, the private line is usually best, he added.

And higher transmission speeds and high data volume makes the use of dial-up lines over long distances very costly. In remote job entry applications where data is sent in blocks and control signals are sent in the opposite direction, dial-up lines can be a problem unless the equipment has a reverse channel capability, Doll said.

## Best of Both Worlds

Some users combine the best of both environments. With primary transmissions on private lines, dial-up facilities are available for backup at many installations. But a dial-up duplication of a 4-wire full duplex private line may require the use to dial two numbers and make two connections, Doll explained.

Since a dial-up line normally uses 1-wire pair, a 4-wire circuit would require the equivalent of four phone lines, two at each end of the line, he explained.

The quality of the lines is also important. Private lines are usually cleaner than

dial-up facilities. And the user has the added advantage of being able to condition a private line when quality becomes critical, usually at higher transmission speeds.

## Top Data Rates

Maximum transmitting speeds on different types of lines depend very much on the type of facility available. But in general, Doll said users can reach a top data rate of 3,600 to 4,800 bit/sec on dial-up lines while private lines can support rates from 7,200 to 9,600 bit/sec. There are, of course, exceptions.

On dial-up lines where the user is not assured of making the same connection each time he dials, a 4,800 bit/sec transmission may work one time and fail on the next attempt.

Most data users begin with dial-up facilities until their data volume and needs are determined. Later, as higher data rates and increased volume become important, a private line network may have advantages, Doll emphasized.

## Terminals Based on TTY Upgrades

(Continued from Page S/15)

tags," according to Dave Beaber, staff consultant at Arthur D. Little. The effectiveness of the higher speed just about doubles the throughput of the terminal, Beaber says.

But 60 char./sec does not necessarily double the output of 30 char./sec machines, Beaber believes. "There is a practical limit from the user's standpoint because 60 char./sec begins to exceed the operator's normal reading speed, he says. And when terminals get into the 120 char./sec class, they are getting into the middle ground occupied by such printers as the Centronics unit. "Here the user is getting into the area of the line printer," Beaber feels. This is the threshold where the user approaches the remote job entry type of terminal, he notes.

This dividing line between the speeds and capabilities of the TTY interactive type terminal and the more intelligent remote batch system is one of the biggest question marks for users. When the user moves from one type of terminal to the other, not only his costs, but the operating characteristics of his communications system usually change radically.

Invariably the more sophisticated remote batch terminal is a more complicated system, requiring more complex operator procedures. One company that has attempted to bridge this gap in a relatively painless way for the user is Memorex.

The company makes a point of concentrating on common keyboard configurations within its 1200 terminal family. On the low end, the 1240 can handle switch-selectable speeds from 10 char./sec to 120 char./sec. Then will be generally the same mechanism, according to Charles Rauche, product sales manager for communications, the user can upgrade to the buffered 1242 which includes 256 or up to 512 bytes of storage.

The 1200 terminal user can further upgrade into magnetic tape cassette configurations and keep the same basic type of equipment as his system evolves from an interactive to remote batch environment, Rauche notes.

An important part of the Memorex terminal line is the Remote Analysis Center. The center allows any Memorex terminal user to call the company's toll free number to access its Lockheed MAC 16 maincomputer. The mini will automatically run diagnostics on the problem terminal and often the cause of the trouble can be isolated by the remote control method, Rauche explains.

This means that help in solving a terminal problem is often only a phone call away. In addition, the call can take minutes while the dispatching of a field service representative could take hours. The Remote Analysis Center went into operation in December 1970, Rauche says, and a record of all trouble reports together

with periodic preventive maintenance calls have helped to reduce downtime on the more than 1,000 Series 1200 terminals in the field.

One of the logical upgrades for the TTY user is the CRT terminal. But this type of device raises new problems. The most important being the absence of a native hard-copy capability with the CRT. There has been a tendency to tie a printing capability to a CRT but one time-sharing user called this type of add-on printer "strictly artificial."

The main utility of the CRT terminal, that of instant display, is being overshadowed by the lack of hard copy, according to one consultant. Some suppliers have found the best way to include a reliable printer with a CRT capability is to build the printer into the terminal.

A system such as the Sycor terminal includes the CRT for editing, the built-in printer and dual cassettes for buffer storage. The two cassettes allow both unattended transmission and receipt of data. The Sycor terminal can operate at 1,200 bit/sec over dial-up or private lines and offers the user considerable versatility for less than \$200/mo.

While the addition of cassette storage gives the remote batch terminal an efficient storage medium, some users see the so-called "floppy disk" included in the next generation of intelligent terminals.

Its primary advantage is that the disk can include a random access capability. It is true that some cassettes do include an indexing track and high-speed winding features but finding a specific spot on a cassette is still relatively slow. "Today's user will probably have to part with his typewriter as the demands of his system increase, he may sell up to a terminal system that can be configured in many ways, according to Arthur D. Little's Beaber.

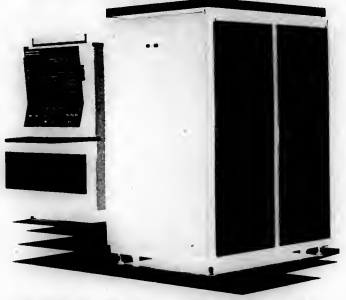
The approach of the Sanders Can-Do terminal, which allows the user to add features to the basic terminal unit — may be the system of the future, Beaber says. Another promising approach, he finds, is the IBM 3735 terminal, which allows the 360/370 to do the programming for the remote terminal and then "transmits the program via the phone line to the

The opposite approach of building up a terminal software capability is used by Sycor. It supports spooling packages such as Bsp and recently developed a complete terminal language to allow programming at the remote site.

It is not clear exactly what type of terminal will replace the popular TTY, but the user seems destined to be dislodged from his cost-effective TTY environment. As user networks grow in sophistication, the terminal will have to handle higher-speed data and have some form of logic or remote batch capability.

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# Vt. Gets Tough With Drunk Drivers, Builds Data Base

**BURLINGTON, Vt.**—Somewhere in Vermont, possibly at this very moment, a problem drinker is being pulled off the road, the latest in a long column of statistics—with one exception. Information about this particular driver will be integrated into a data base on the University of Vermont campus and become part of Project Crash, an operational demonstration program designed to remove drunk drivers from the state's highways.

Data on the impaired driver goes into building a computerized vehicle operator file which staff members of Project Crash

can analyze on demand. The information is stored in a large-scale computer some 30 miles away; Project Crash headquarters has immediate access to it through an NCR 260 Thermal Printer terminal.

"Delays cannot be tolerated" explained Linda Flowers, chief of research and statistics. "For daily operations, we want to be keyed into changes in arrests, injuries, fatalities and convictions and to correlate with the base line data. We must be able to monitor any changes that result from our program," she added.

Funded by the National High-

way Traffic Safety Administration, as part of the National Alcohol Safety Action Program (Asap), Project Crash (Countermeasures Related to Alcohol Safety on the Highway) has been implemented in six Vermont counties, which house slightly less than 50% of the state's population and account for a proportionate number of drunk driving accidents and arrests. The remaining counties in the state serve as a control.

Because the program has neither the personnel nor the facilities to maintain records on a current basis, Project Crash became a part of a communica-

tions network linking a variety of data terminals to a multipurpose time-sharing computer in the university's Academic Computing Center. The computer enables Project Crash to store and analyze different types of information.

"Ours is not the kind of operation that needs specific information on a schedule basis," Flowers pointed out. "When the director needs a particular table or fact, he wants it now," she said.

For example, when conducting seminars for judges and state's attorneys, the staff needs to

have the latest statistics to report.

Simply, the terminal, a printer that generates 30 char./sec, is an economic and convenient method of making use of a large-scale computer. On-line to the system, it also offers a dynamic means of obtaining information.

Compact and quiet, the terminal sits on a desk in an office occupied by several people. Yet, because printing occurs from heat transfer rather than impact of keys against an ink ribbon the printer does not disturb others in the room.

## College Center Gives Students Top Priority

**TAMPA, Fla.**—Hillsborough Community College was created to serve the community's educational needs.

In that same respect, Thomas Tyree, director of data processing, feels the goal of his operation, built around a Univac 9400 computer, is to "serve the student."

In only its fourth year, enrollment at the college has reached 7,400 with predictions of 10,000 within five years and an ultimate top of 20,000 to 25,000.

The computer operation is even younger. The 9400 was installed last September and about half of the computer time each month is currently devoted to student usage in one form or another. And Tyree expects this to grow, just as he expects the system and its role in the affairs of the college to expand.

About 150 students per semester are directly involved with the computer. Most are taking one or more computer courses as a required part of the curriculum. These include students in nuclear medicine, police science, food and lodging management and accounting. Many secretarial science and electronics students are using computer courses as electives.

And there is a certain group which is "looking to see if computer programming is their bag," Tyree added. "We turn out about six to eight programmers a year."

### Turnaround Time

One of the big advantages to students of an on-campus computer center is quick turnaround time. "Before we got our own computer, it usually took two to three days for students to get results of programs they had written," Tyree stated. "Now they bring the card decks in here and 15 minutes later have the results. We're working on reducing this lead time."

Besides serving the student directly, the computer center is used in systems design and implementation, payroll, admission and student records, grading, statistical studies, budgeting and mailing labels.

Registration, for instance, is now held five times a year. "I can see within two years where we will have year-round registration and the different campus locations will have to be tied on-line to the computer center," Tyree said.

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# Small Businessman 'Ignored' in Terms of DP Usage

By a CW Staff Writer

**ST. LOUIS**—The typical small business has problems that could be solved by using computers, but many manufacturers have not shown the small businessman "how their equipment can solve his specific problems," a recent study has revealed.

A six-month study of 50 businesses here, 43 of which were black-owned, showed that many of those interviewed "felt they couldn't afford a computerized application," noted Dr. Robert E. Markland, associate professor of management science at the University of Missouri here. Over half of those interviewed said one of their current "major problems" was "maintaining adequate records, primarily for tax purposes," Markland reported. A "sizeable" number reported difficulty in obtaining business information.

## Potential for Computerization

Both of these problem areas "suggested a potential for possible computerization," Markland said, "and a number of the

interviewees" indicated they were "presently using a manual accounting system which was not satisfactory."

Markland published his findings in a recent issue of the *Journal of Systems Management*, the monthly magazine of

## The Small Systems User

the Association for Systems Management (ASM).

The businessmen expressed "generally favorable" attitudes toward computers, but many expressed "some skepticism concerning their feasibility," the report noted.

## Negative Comments

Typical negative comments on computers to cost, time for implementation, job security, start-up funding and reliability, Markland listed some of the comments:

- "As a small businessman, I don't

understand the computer."

- "I'm too small to afford, let alone use, computers in my business."

- "A lot of computer systems don't work very well."

The report concluded that there was a "high degree of awareness" by small businessmen of the computer's potential. Those interviewed expressed an "acute concern for the lack of information needed" to efficiently operate businesses.

While a "sizeable potential" for computer usage may exist within the small business community, Markland advised the small businessman contemplating development of computerized information systems to first "make a careful economic and operational analysis."

Such a potential user must define "whether or not the proposed application will save more than it will cost to develop," he commented.

Another factor in small-business planning must be manpower, specifically whether there is adequate manpower to "successfully utilize the system after it

has been developed." Research showed "economic feasibility" to be the most important element, Markland reported.

## 'Likely Starting Points'

Accounting and financial applications, he continued, are the "most likely start-

## 2 Packages Ready

Elsewhere in this issue, especially in the Software and Services section, there are items of interest to small systems users.

Two packages are described in that section, both from independent vendors and both suited for general business applications.

One is an operating system for the Singer System Ten; the package gives real-time users more flexibility, according to the vendor. The other package is actually a modification of Mini-Bit, which can now be used on the IBM System 3.

ing points" for developing computerized systems, but even then, "it is unlikely that many small businessmen" would be "willing to make any financial commitment... without first seeing tangible results over a reasonable time period."

Assuming successful development and implementation, Markland said, the small businessman expressed other areas which could be analyzed: sales data, personnel records and inventory control.

## 'Virtually Ignored'

"The small businessman," he concluded, "particularly the small minority businessman, has been virtually ignored in terms of computer usage."

Identifying the small businessman's "real problems" and the development of systems at a "reasonable cost" could permit such a person to use computers in business, he said.

More accurate information for decision-making "through computer-oriented management would greatly contribute to the health and growth of the small urban business," he said.

## In-House Education Helps New Operators Understand Jargon

**PHILADELPHIA**—Day-to-day clerks who become computer operators sometimes don't understand computer jargon, but a continuing in-house education program is solving that problem for one firm, according to Gerry Boyle, DP director for U.S. Cold Storage Corp.

Boyle is currently involved in installing IBM System 3s in the company's 26 warehouses around the country, following a year's operation here.

Sites start with inventory applications, and then the operators are trained on payroll, accounts receivable and general ledger. Boyle said IBM had bought some of the software he had developed, and that the software could be used by other small offices.

## Few Problems

After initial installation, most of the training problems or routine questions are handled by phone, Boyle said. Problems arise when former clerks must communicate verbally about the new computers, but "we haven't run across a problem yet that couldn't be handled over the phone," he said.

While there is no direct computer-to-computer communications now, the company is "looking at" the possibility of establishing communications with Cold Storage's parent, American Consumers Industries, Inc., which has a 360/20, also in Philadelphia.

Boyle is responsible for the S/3 development and installation for the Cold Storage Corp. sites.

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## Key-Disk-Tape Solves Agency Problems

AUSTIN, Texas — Government agencies face increasing demands for efficiency in their operations as workloads rise, often on tightened budgets. The Railroad Commission of Texas, located here is no exception.

The Railroad Commission serves primarily as a regulatory agency for the oil and gas industry. It maintains records on more than 200,000 oil and gas wells that produce about \$4-billion worth of raw products annually.

Maintaining production records and calculating "allowables"

(amounts of hydrocarbons permitted to be taken from the ground) for the whole state impose a heavy data processing load on the Railroad Commission. Production reports must be made monthly. Allowable schedules are issued monthly and some 600 allowable supplements are issued daily. In all, about 285,000 records are susceptible to change at any time.

The agency has fully computerized its DP to handle this volume. But entering data into the computer proved more of a problem than the main process-

ing—at least until recently. To solve the problem, the Railroad Commission installed a new data entry system, an Infotex 1301 Intelligent Key Entry System. It consists of eight keystations, at which operators, working independently, enter data from source documents directly into a shared processing and control unit. Data is stored in a magnetic disk, edited and verified before being transferred onto magnetic tape for processing in the main computer.

The Railroad Commission replaced 10 keypunch machines with the eight keystations of the single Infotex system. In addition, the agency got rid of its card sorters.

Overall savings resulting from these moves run around \$700/mo. Also, a 20% smaller workforce is handling a gradually increasing workload.

The system is known as a key-to-disk-to-tape data entry system because the shared processor temporarily stores and permits editing of data before its transfer from disk to tape, ready for computer entry.

The Railroad Commission has gained greater work flexibility as well as control with its system. The general ratio of operators keying data to operators verifying is five to three, but this balance between functions can easily be changed as required without switching operators between keystations.

## 90,000 Students Share Computer

CHICAGO — The Northwest Educational Cooperative (NEC), a consortium of eight grade school and two high school districts in suburban Chicago, has selected a Xerox Sigma 6E computer for its member schools.

NEC serves 93 elementary schools and nine high schools, with a combined student population of approximately 90,000 as well as some 7,500 full-time and part-time employees.

The computer will replace two computers currently being used by the cooperative. Initially, it will take over the tasks of payroll, student scheduling, attendance and grade reporting, accounts payable/receivable, general ledger accounting and program/cost accounting.

As a second phase in its program, NEC plans to install remote, on-line computer terminals in its member schools, linked by telephone lines to the computer.

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## CI Notes

### Used DP Market Seen Steady

ELMSFORD, N.Y. — "The market for used computers was generally steady during the past quarter," according to a recent report by Time Brokers, Inc. Prices of 360/50s recovered somewhat from the lows early this year, and 360/40 prices are seen as a very attractive alternative to adding extended core to a 30, the report stated.

"The 360/30 model demand, created by capacity upgrades from Model 25 and 360/20 sub-model 5s, is very strong. There is a good possibility that this trend will continue," according to the report. Larger machines, such as 360/50s and 65s, "have held relatively stable at their current low prices." A recent flurry of demand for 65s stemmed from orders placed by one or two companies, and the "general long-term trend for 65s and 50s appears to be down," Time Brokers noted.

### Office Dealers to Sell Computers

GRAND RAPIDS, Mich. — Cascade Data Inc. is seeking office equipment dealers as agents for its line of small computers and software programs. "COP is becoming an important management tool for small businesses. . . . The office equipment dealer serves these small businessmen and knows their needs," observed Frank Mack, Cascade vice-president.

### Supershorts

Greyhound Computer of Canada Ltd. will market Calcomp type disk drive systems in Canada.

Potter Instrument Co., Inc. has been awarded patent 3,665,436 for the development of its "Hard Coat" magnetic recording head. The Potter invention involves coating dual-gap magnetic heads with a hard ceramic material on each side of the transducing gaps.

Data General Corp. has delivered its 3,000th minicomputer, a Nova 1200, to Action Communications Systems of Dallas. The computer will control communications for Fruehauf Corp. in its Detroit headquarters.

I/O Devices, Inc. has signed a memorandum of understanding with Omron Tateisi Electronics Co. of Japan and its subsidiaries and Marubeni America Corp. under which Omron and Marubeni will invest in I/O Devices and receive rights to manufacture and market I/O's products.

GTE Information Systems has established its Service Division as a separate corporation which will have headquarters and training operations in Boulder, Colo.

Cybernetics has granted Cable and Wireless Ltd. a license to sell, throughout most of the world outside of North America, Cybernetics' Tin Can telecommunications software systems as part of its product line.

Randolph Computer Corp. has formed Randolph Leasing & Financial Ltd., based in Zurich, Switzerland, and Randolph Leasing Corp. Ltd., a domestic international sales corporation, which will handle the exporting of computer equipment overseas.

## Study Spots Selected Markets

# Mini Shipments to Grow 200% by 1978

NEW YORK — The value of yearly minicomputer shipments will grow by more than 200% between the end of 1971 and 1978, according to Frost and Sullivan, a computer industry research firm here.

The value of the systems shipped during 1971 was \$250 million, the firm said, predicting this would grow to \$820 million by the end of 1978. In terms of units the firm predicted there would be up from 33,000 units at the end of 1971 to 150,000 units in use at the end of 1978, 150,000 units in use at the end of 1978, 150,000 units installed at year-end 1971.

In the past year alone, the firm said, growth in minicomputer sales accounted for over 80% of the new U.S. computer installations with over 12,000 units valued at \$250 million shipped during the year.

In 1972, the firm predicted shipments would reach over 15,000 units, up 29%,

with a total value of \$315 million, a rise of 22% over the 1971 level.

Beyond 1975, the firm said minicomputer industry growth would slow to an annual level of 15% to 18%, but the growth rate would be higher in selected end-user market segments.

In communications-related fields, such as communications front ends and concentrators, remote terminals and message switching, the growth rate will run around 40% to 60% annually, the firm noted.

At the same time, the firm said that new rather than replacement customers are appearing in such applications as on-line, scientific and real-time application areas.

### Industrial Control Market

In the industrial control market, Frost and Sullivan predicted shipment would grow by 164% over the next six years, from the \$108 million in shipments regis-

tered in 1971 to \$285 million in shipments expected in 1978. Shipments for 1972 to this market segment were estimated at \$130 million, which is expected to rise to \$225 million by 1975, according to the firm.

In the laboratory instrumentation area the shipments are expected to show a compound growth rate of only 69% over the period, making this market segment one of the slowest growing for present and potential mini makers.

Shipments to the laboratory instrumentation field were pegged at \$65 million in 1971 and will be \$110 million by the end of 1978. Shipments for 1972 were put at \$72 million and the shipments are expected to reach \$98 million by the end of 1975.

"Although scientific, engineering and control uses for minicomputers have dominated until now, end-use patterns are changing substantially," the firm stated, predicting that "these initial end uses are expected to account for a smaller part of the overall market by 1978."

"Increased shares of the market will go to data handling, data communications and other end uses including business, transportation, typesetting, editing, education and moving vehicles. Assisting these new positions will be a continuing downturn in average minicomputer costs."

These "other" uses of mini accounted for \$41 million worth of shipments in 1971 and are expected to show a staggering 388% growth by the end of 1978, rising to \$200 million in shipments that year. The 1972 shipments to these users will be valued at \$50 million and will be worth \$117 million by the end of 1975.

During this time there will also be an increasing number of peripherals designed expressly for mini systems, the firm said, predicting the current minicomputer peripherals market of \$50 million to \$55 million will grow to about \$350 million by 1978 in shipments.

Foreign markets have been and will continue to be important to the U.S.-based minicomputer manufacturers, the firm said, projecting a 25% growth rate in foreign sales of mini systems. At the same time, the firm noted that foreign competition was stiffening, especially in Japan, West Germany and The Netherlands.

## Ibmec Prefers Mini Peripheral Market to Plug-Compatible Fight

By Edward J. Bride  
OF THE CW STAFF

SOUTHBORO, Mass. — Companies that compete with IBM's plug-compatible peripherals field can have their plans "so dictated by IBM" that Ibmec would rather market peripherals for the other

"most common" families of minicomputers, according to Ibmec chairman Frank Druding.

This is also true for the new Digitronics Division, acquired from Digitronics Corp., as of July 1. A majority of the Digitronics Corp. — 68% — was held by North American Philips.

Druding said IBM's competitors are subject to the whims and plans of the industry giant; any time IBM wants to give these firms a "bad time," he said, "IBM can give it."

Interviewed at the new Digitronics fac-

## Brooks Attacks FAA Pact With Raytheon As Taxpayer Waste

WASHINGTON, D.C. — "Federal Aviation Administration purchase of unsuitable display equipment from the Raytheon Corp. amounts to little more than baiting out this contractor at the expense of the taxpayers," Rep. Jack Brooks (D-Texas) declared recently.

Brooks, chairman of the House Government Activities Subcommittee which has made extensive investigations into irregularities in FAA air traffic control development, charged that the FAA has paid Raytheon \$1.5 million to purchase air traffic control display units that, by a wide margin, failed to meet government specifications.

"Purchase was on an 'as is' basis and was for the ostensible purpose of reshipment to the Raytheon factory in Massachusetts to establish some type of display testing laboratory," Brooks said.

"Just why the FAA should purchase defective equipment that does not meet government specifications to help furnish a contractor's laboratory is a real mystery the Congress must seek to solve," Brooks added.

"In January 1967," according to Brooks, "the Raytheon Corp. was granted a \$44 million fixed-price contract for the production of the display unit of an air traffic control system. As of this time, more than four years beyond the initial delivery date, Raytheon has yet to provide the government with a completely acceptable production model."

"Meanwhile," Brooks continued, "over the years, government investment for this equipment has risen to more than \$115 million, and despite Raytheon's bad performance, FAA has awarded the company additional contracts for display units."

## Company Profile

ity here, Druding claimed the acquisition gives Ibmec a "complete line" of peripherals for minicomputers.

Ibmec disk drives, with additional interfaces in the development stages, plus the Digitronics printers, magnetic tape transports, punches and data acquisition and communications products, round out the new family of peripherals.

The merged companies, with annual sales of \$15 million to \$20 million, should be profitable in the first year, Druding predicted. The Eastern strength of Digitronics' marketing and field support people, plus the Western strength of Ibmec, made the merger a "natural," he commented.

The company markets to both OEM and end users, with OEM its stronger area, he continued.

All disk products will be manufactured on the West Coast by a new, tentatively named Data Stor Division.

The combined company now employs about 170 persons in the Data Stor Division, and almost twice as many in Digitronics, which is just entering the production stage on its Model 200 printer.

"Digitronics had everything but disks, and that's where we were very strong," he said.

While the Digitronics Division had suffered substantial losses in recent years because of the consolidation of marketing, support and manufacturing should bring profitability to the combined firms, Druding opined.

Ibmec is home-based in Santa Clara, Calif.



## Flight Teacher

Flight instructor controls performance of DC-10-30 flight simulator on two Sanders Adda 930 display terminals. The units, linked to simulators developed by the Eastern States Ltd., Montreal, display updated alphanumeric data, including malfunction lists, tables of aircraft performance parameters and "lesson plan" notes for the instructor, and graphical data such as bar charts, time-history plots and navigation maps.



The Novar 5-10 Touch Tone Telephone Translator makes it possible to use the millions of Touch Tone phones around the country as remote keyboards for data entry. One has simply to call a Novar data collection station (of which the 5-10 is a part), enter information by using the phone's 12 keys, then sign off by hanging up the phone. A quick, easy, inexpensive way to a nationwide network.

## GIS INFORMATION SYSTEMS

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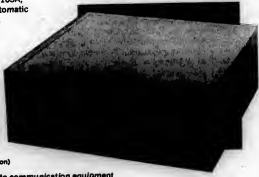
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Series 330—Replacement for 103A, 103F, 103E, 113A and 113B. Automatic answering with CBS or CBT DAA. 16 modems in a 19" rack. Colored display panel indicates 4 controls and 2 data functions.

Auto answer modem ..... **\$195**  
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Complete cabinet, display and 16 Modems ..... **\$3,825**  
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Also a complete line of other data communication equipment including frequency division multiplexers, data channel expanders, data channel concentrators, Teletype terminals, etc. Write for space today.



Model 301A—Acoustic coupler TTY and EIA interfaces. .... **\$245**

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Model 302D—replacement for 103A. Automatic answering with 1001B, CBS DAA. TTY motor starter, initiate & respond to long space disconnect and 10 minute activity disconnect ..... **\$325**

Model 302F—replacement for 103F. Private line and 1000A, CBT DAA applications ..... **\$245**

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## \$200 Million to Be Spent

# Western Firms Rule Hungarian Market

By Bohdan O. Szuprowicz  
Special to Computerworld  
MUNICH—In all of East Europe, Hungary and Czechoslovakia are leading in the variety of Western, Soviet and East European-produced computers installed.

The situation in Hungary never was as bad as that in Czechoslovakia (CW, Feb. 23) but became sufficiently serious a few years ago when, in a rush to computerize, equipment was bought indiscriminately from 15 different suppliers in eight different countries.

Today, estimates put the total Hungarian computer population at 120 to 160 machines depending on who calls what a computer. By discounting some punched card accounting machines, often counted as electronic computers in East Europe, the lower figure is probably more representative.

### 60% From West

Among the Hungarian installations, as many as 70% by value and at least 60% by number come from the West, making Hungary an Eastern socialist country with one of the highest proportions of Western computers.

At the Budapest International

Fair last May the Hungarian R-10 computer was introduced to the public, but went mostly unnoticed because other machines on display captured attention.

ICL, Honeywell-Bull and Univac are the leading Western computer suppliers to Hungary. IBM, Siemens and Fujitsu have also made their mark and Control Data is involved in long-range training of computer personnel with the Hungarian state organization Szamok. Soviet Minks and Polish Ordas are the main socialist imports.

### Modular R-Units

According to a recent Hungarian report Russian R-unit computers are made up of modular R-units on a building block principle. Hungary, within the Rial project, specialized in the production of the R-10 which is the smallest of the Rial series.

But the Unified Computer Systems apparently encompasses more than the Rial series; the Videoton—produced 10010B and 0010BM, under license from the French CIT, also fall into this category. By the end of 1971 15 such machines were built and Hungary expects to complete 200 units by the end of 1975.

The Central Physics Research Institute came up with a mini-computer of its own and the first of this series, the TPA/1, is already in production. Designed for scientific and educational use it was already successfully introduced to users in the Soviet Union and East Germany.

### Negotiating with Univac

Hungarians also claim they are negotiating with Univac regarding exploitation and promotion of the TPA/1 computer, presumably.

ably in the West. Of the Western suppliers of computers in Hungary, Univac is well entrenched with about 20 machines installed and follows only ICL and Honeywell-Bull in number of installations. Significantly, most Univac installations are in the small computer category.

Another area of considerable activity in Hungarian data processing is peripherals. Here Hungarian enterprises appear to favor cooperative and licensing agreements with Western firms. Hungarian reports indicate such arrangements have been made with the French firm, Sagem, a peripherals manufacturer. They also state that negotiations are taking place with Data Products for licensing of certain peripherals in Hungary.

### Big Plans

Hungary is struggling to define a meaningful program which will allow its industry to produce 10 times as many computers by 1975 as it did in 1970.

There is also a Central Development Program for Computer Technology created by the Council of Ministers for purchase of computers and services abroad. In this case, approximately \$200 million will be spent for computers and services from abroad during the current Five Year Plan (1971-1975).

Not all such appropriations, of course, will go to Western suppliers because the Soviet Union, Poland, Czechoslovakia and East Germany all have a stake in the Hungarian computer market. But if one considers the past preference of the Hungarians for Western equipment, the market is significant and a large Western equipment base is already there to help.



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## Expansion Minds

# Report Details Japan DP Utilization

**TOKYO**—The average number of computers installed per company here is 1.9 units, according to a recent report of the Japanese Computer Utilization Development Institute. Small- to medium-size machines represent the majority of all installations, the report said, and the average number of peripheral units per user is 14.7, the report said.

### Future Expansion

In addition, the report indicated almost 80% of the present users plan future expansions. In the next five years, the report noted, the users expect to expand their EDP operations 2.8 times.

The report said that 31.2% of the installations (by purchase value) have systems valued at

over \$1.6 million; 23.4% have installations with a value of between \$800,000 and \$1.6 million; 21.5% are valued between \$325,000 and \$800,000; 14.1% between \$130,000 and \$325,000; and the remaining 9.9% under that value.

In number of units, small- to medium-size installations account for 74.6% of all Japanese computer installations, according to the report.

The iron and steel industry has the greatest concentration of systems with 4.8 computers per user, followed by the electric and gas utilities with 3.6 units per user. The insurance industry has 3.4 units per user and the government has 3.2 per installation.

The average number of hours of utilization per unit is 176

per month. Of the companies responding, 57% reported they were using computers less than 200 units, the report said.

Among the various benefits gained directly from computer use, 91.5% of the companies cited "increased accuracy of information processing," 55.1% cited "manpower cost saving" and 34% said "simplification of file management."

As for indirect benefits from computers, 50.4% of the responding companies cited "ease in obtaining management information."

In addition, 45.8% of non-using companies surveyed said they plan to use computers within three or four years, and 42% of those companies indicated they favor medium-size computers.

## Process Eases Salvage of Head Diodes

### Special to Computerworld

**HAWTHORNE, Calif.**—NCR is using a new process to salvage components for its disk memory systems and some CPUs.

The advent of printed circuit boards made the disk memory feasible, since many tiny components can be mounted in a single small package to do the work of earlier discrete components which would have used 10 times the space now required. When one of these multiple components fails, however, its recovery and replacement are difficult and costly.

The former Electronics Division of NCR here—now under Control Data due to the NCR-CDC peripherals deal—produces the 655 Class Flying Head disk memory. Twelve heads or transcribing mechanisms are used with each disk, to cover 16 tracks of information.

The operation of the Flying Head depends upon the close placement of 48 low-cost diodes, and when one of these diodes fails, the whole assembly must be removed and the diode replaced.

### Boards Coated

Further complicating the rework operation is the fact that the printed circuit boards are completely encapsulated in a conformal polyurethane coating. Stripping the boards of this coating is a touchy and costly operation, since the boards must be 100% contamination-free after rework. Any loose particles of coating in excess of 3 microns can cause head crashes in the system.

To solve the problems Edward H. Weaver, supervisor of industrial engineering and overseas support, turned to the Access Process, from Amphipol, Sams

### Division of Bunker Ramo.

The process selectively removes all kinds of encapsulating and potting materials. Because the process is carefully controlled, no damage to salvageable components results, Weaver said.

"The service is now saving us approximately 60% of the stripping portion of the rework, compared with our previous method," Weaver said. "In addition, the boards coated by the Access Process are cleaner than we've previously been able to get them, so that a better quality contamination-free coating results."

The Access system is also used in refurbishing NCR's Rod Memory Computer (RMC). Although no longer produced by NCR, it is still alive in the field, and lead units are returned to the factory from time to time for rework and updating.

## CDC Names 3 Senior Vice-Presidents

**MINNEAPOLIS**—Control Data Corp. has promoted three executives to senior vice-president positions. The named three managers at computing development laboratories and appointed Robert W. Duncan as vice-president, business strategy.

Thomas G. Kamp, senior vice-president of peripheral products, assumes responsibility for the

### Executive Corner

design, development and manufacture of memory devices and optical character reading systems; magnetic core memory manufacturing; and business products operations.

Paul G. Miller is senior vice-president of marketing, heading CDC marketing activities in 27 countries.

Robert M. Price, senior vice-president, services, directs CDC's engineering, educational and professional services, as well as computer services, the American Research Bureau and several joint venture services companies.

Named to manage operations at CDC's Computing Development Laboratories are Gary S. Christensen, Lynn W. Gallup and Donald J. Pagliocopi. Christensen will direct the Network

and data base aspects of the Star system development program in Arden Hills, Minn., and Santa Ana, Calif.

Gallup heads design and development activities for the company's 8000 series systems, circuitries and memories, and Pagliocopi is in charge of the design, development and production of CDC's Star-100 system.

Robert W. Duncan will be responsible for the development of strategy for CDC's computer business as well as coordination of the firm's multinational joint business ventures with other DP manufacturers. He will continue to direct CDC's financial services marketing group.

### Other Moves

• Lewis M. Brunsom and Bob O. Evans have been elected vice-presidents of IBM.

• Karl E. Wenk Jr. has been elected president and chief executive officer of Intercomputer Corp.

• William W. Fain is now president of Consolidated Analysis Centers Inc.

• Four new officers have been elected at Inforex, Inc. Richard H. Bowen was named treasurer, William J. Brown, vice-president,

director of systems development; Frank D. Evans, vice-president, director of manufacturing; and Fritz S. Kern, vice-president, director of European operations.

• Benedetto Capomazza is president of Honeywell Information Systems Italia.

• Jean-Pierre Brule has been named president of the Honeywell-Bull computer companies.

• Charles K. Grundman has been named vice-president, central operations, of Univac.

• Leonard M. Cozza has been named director of large EDP systems development at NCR.

• Richard M. Tyndall has been named director of manufacturing operations for the Large Computer System Division at Burroughs Corp.

• Gordon Bell has been named vice-president for engineering at Digital Equipment Corp.

• J. Roy Morris, chairman and chief executive officer of Cybernetics Inc., has resumed the role of chief operating officer.

• John C. Thuma has been appointed vice-president of Booths Computer Corp., responsible for marketing the domestic leasing portfolio.

## Adapso Charges

## Government on Defensive in IBM Case

NEW YORK—Recent pretrial testimony in the Justice Department antitrust suit against IBM indicates that IBM's requests for information from the government have put the government on the defensive in the case, the Association of Data Processing Service Organizations (Adapso) said recently.

Adapso is monitoring all of the court records filed in relation to the case and making them available to the press and the public, because it contends that the government has failed to meet its responsibilities in the area of government information.

"Our regular inspection of the court docket and documents made available to us discloses that all recent court developments made public during the past two weeks, as during the

past several months, continue to relate almost entirely to IBM's demands that the government produce a vast amount of documents for IBM's inspection," J.L. Dreyer, executive vice-president, said.

"The transcript of a hearing before the court, held on March 31 but not docketed or made available until June, shows that the government initially agreed to IBM's discovery."

"Therefore, despite government protestations to the contrary, it was so clearly forced to reverse its original position that even Chief Judge David N. Edelstein, the judge presiding over the litigation, finally stated that the government's claim was 'certainly a position contrary to what you took approximately two weeks ago.'

"Claims of national security privilege were frequently interposed by the directors of Central Intelligence, the National Security Agency and the Federal Bureau of Investigation."

"Finally on June 29, 1972, the testimony of Charles F. McKnight of the Federal Aviation Administration, Department of Transportation, persuaded Judge Edelstein to sign a modification order with respect to the government's production of documents."

Bernard Goldstein, Adapso president, said: "We are most disappointed that the government seems to be cast in the role of a defendant rather than a prosecutor."

"Perhaps all of this is the result of an IBM delaying tactic, in accordance with the strategy that the best defense is a good offense."

"The government has conceded that there will be at least a year or more of additional pretrial discovery; no trial date has yet been fixed," Goldstein said.

"One of the reasons we are so insistent that all proceedings before the court be in public, not in chambers, or undocketed, or unavailable even where docketed as at present, and that the press have access to what is going on in this litigation, is because we believe that with public surveillance this kind of thing would stop," he concluded.

## Contracts

Documentation Inc. has received an order from Nixdorf Computer of West Germany for 1,000 M-Series card readers.

Datacraft Corp. has received an order from Harris-Interprete Corp. for 66 computers valued at about \$1.5 million for use in utility, pipeline, industrial and railroad control systems.

Odec, Inc. has been awarded a contract for line printers by the Business Machines Division of the Singer Co. The contract, which could exceed \$15 million, calls for the inclusion of printers in small business computer systems and point-of-sale systems.

Interactive Data Corp. has contracted Fairchild Camera & Instrument Corp. to build a 1.5M byte semiconductor memory subsystem for an IBM 360/67.

SYS Computer Corp. has received a contract from Mead Data Central, Inc. for the manufacture of CRT displays for use with Mead's computerized legal and accounting research services.

Universal Technology Inc. has received a \$300,000 contract from Litton Industries for electronic keyboards.

Conrac Corp. has received a \$2.8 million contract to provide a Race Information Display for the New York City Off-Track Betting Corp.'s 100 betting offices.

Peoples' Pension Plans, Inc. of New York has contracted Computer Facilities Corp., Ltd. to provide DF services with respect to tax-sheltered retirement plans offered by Peoples'.

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**COMPUTERWORLD**  
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## Earnings at IBM, Burroughs, Honeywell Up Sharply in 2d Quarter, Six Months

The computer industry appears to be regaining some of its strength judging from greatly improved second-quarter and six-month earnings reports from IBM, Honeywell and Burroughs. Second-quarter earnings figures show a 20% improvement at Burroughs, a 22.4% hike for IBM and a 65.9% rise at Honeywell compared with the same 1971 period.

Although earnings for the second quarter and six months last year were not spectacular, real progress was made, with Burroughs setting records for the six months, and IBM posting new highs in earnings for both periods.

IBM's second quarter earnings reached \$312.2 million, or \$2.70 a share, up from \$255.1 million, or \$2.22 a share, in the same period last year. Revenues rose 21.8% to \$2.36 billion, a record.

### Tab Products Earnings Rise 123% for Year, Last Quarter a Record

PALO ALTO, Calif.—Tab Products Co.'s earnings rose 123% for the year ended May 31, and fourth quarter earnings were the best in the firm's history, according to President Harry W. LeClair.

Earnings for the year were \$699,000, or 83 cents a share, compared with \$314,000 or 38 cents a share for the prior year. Revenues rose 6.5% to \$19 million, up from \$17.8 million last year.

Higher profits were attributed to improved sales plus the initial effect from production of the company's new electronic card punch-verifying machine during the fourth quarter. Factory start-up costs had previously been expensed.

Fourth-quarter earnings reached \$303,000, or 36 cents a share.

For the second quarter, up from \$1.94 billion in the 1971 period, Honeywell showed earnings of \$15.1 million, or 81 cents a share, up 65.9% from \$9.1 million, or 52 cents a share, in the 1971 quarter. The figures include tax credits of \$1.6 million in this year's quarter and \$881,000 in the 1971 quarter. Revenues rose to \$510 million, up 10.3% from \$462.2 million.

Burroughs' second-quarter earnings rose to \$20.3 million, or \$1.09 a share, compared with \$16.9 million, or 92 cents a share in the year-ago period.

Revenues reached \$252 million from last year's \$225.8 million, a 12% climb.

Figures for the six-month period also showed strength. At IBM, earnings rose to another record, \$617.9 million, or \$5.34 a share, an increase of 22.1% above last year's \$505.9 million, or \$4.41 a share. Revenues reached \$4.68 billion from \$3.81 billion a year ago.

But sales and rental revenue increased 8.8% in the first half, compared with a 14.4% gain in 1971's first six months.

Installations of new DP equipment continued at a "relatively high level" in the second quarter, President T. Vincent Pearson noted, adding the proportion of equipment sold rather than rented "was considerably higher in the second-quarter and six-month periods than the depressed level of the comparable periods of 1971." This factor "contributed significantly to the year-to-date increase of 22.7% in total gross income," he noted.

Honeywell's six-month earnings rose 63.7% to \$26.3 million, or \$1.41 a share, from \$16.1 million, or 92 cents a share in the 1971 period.

Revenues were up 7.6% to \$96.2 million from \$89.2 million. Chairman James H. Binger called the earnings picture "heartening" but cautioned that the rate of improvement was affected by the slow first half last year.

"The outlook for the balance of the year is good," he said. The computer business is "strong worldwide and is contributing significantly to improved earnings." Net computer bookings showed solid improvement, he said, "reflecting among other things the strong acceptance of our new product lines, the Series 6000 and Series 2000."

Burroughs set records for six months in earnings, revenues, orders and backlog. Earnings rose 16% to \$32.5 million, or \$1.75 a share, from last year's \$27.9 million, or \$1.52 a share. Revenue for the first half totaled \$471.6 million, a 9% rise from last year's \$433.9 million.

Worldwide incoming orders for the six months reflected a 28% increase over 1971, according to President Ray W. MacDonald.

Orders for DP products and systems were "particularly strong," he noted, showing a 52% increase over the 1971 period.

Total worldwide backlogs are at record levels, 29% above that at the beginning of the year, he said.

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## Acquisitions

Planning Research Corp. has agreed to acquire Inmarco, Inc., a unit of Columbia Pictures Industries Inc., for about \$5 million.

Information Dynamics, Inc., a Chicago-based computer software company, was acquired by World Management Systems, Inc., a management and holding company. Information Dynamics will operate as a wholly owned subsidiary.

Richard C. Jones has acquired a majority interest in Programmatix, Inc., a subsidiary of Applied Data Research Inc.

Cubic Corp. has purchased the facilities and property of Western Optics with an option to acquire the California firm. Western Optics is a supplier of optical equipment for commercial and defense markets.

Graphic Sciences Inc. has agreed to acquire the remaining minority interest in Hideo International Inc., a computer leasing firm, which is presently an 80%-owned subsidiary of Graphic Sciences.

United Computer Facilities Inc. has acquired the controlling stock in Toltec Corp., which will be known as UCF of Washington Inc.

International Health Sciences Inc. has acquired a 79% interest in Systems for Advanced Information, Inc.

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## New Registrations

**COMPUTER COMMUNICATIONS, INC.**, 5833 W. Siemon Ave., Culver City, Calif., a computer systems firm, filed to register 13.5 million of 9% convertible subordinated debentures, due 1992. Proceeds will be used to retire bank indebtedness and working capital.

**BRADFORD COMPUTER & SYSTEMS, INC.**, 1700 Broadway, New York, N.Y., designer and operator of computer systems, filed to register 500,000 shares of common. Proceeds, at \$45 per share maximum, will be used for an acquisition and for working capital. The underwriter is Klenler, Peabody & Co. Inc., 20 Exchange Place, New York, N.Y.

**NSI DATA CORP.**, 340 Fisher Ave., Costa Mesa, Calif., manufacturer of source data entry systems, filed to register 397,170 shares of common. Proceeds, at \$14 per share

maximum, to be used to repay bank loans and for working capital. The underwriter is F. Eberstadt & Co., Inc., 61 Broadway, New York, N.Y., 10006.

**COMPUTER CONSULTANTS INC.**, 1611 University Blvd., N.E., Albuquerque, New Mexico, designer and operator of business information systems, filed to register 300,000 shares of common. Proceeds, at \$5 per share, to be used to repay loans and for working capital. No underwriter is involved.

**CODEX CORP.**, 15 Riverside Ave., Newton, Mass., a data communications equipment firm, filed to register 200,000 shares of common. Proceeds, at \$22 per share maximum, to be used to reduce bank borrowings and for working capital. The underwriter is Kuhn, Loeb & Co., 40 Wall St., New York, N.Y. 10005.

## Earnings Higher at 4 Service Firms

Four service bureaus have reported improved earnings in recent periods, and two, National CSS, Inc. and United Data Centers, Inc., have reported second-quarter operating revenues and earnings.

Earnings at National CSS, Inc. totaled \$281,464, or 26 cents a share, an increase of 206% over the \$92,054 or 9 cents a share, in the three months ended May 31, 1971.

Revenues reached \$3.8 million, a 49% improvement over the \$2.5 million registered in the same period last year.

Improved earnings and revenues were attributed to the in-

stallation of new leased computers at the data centers in Stamford and Sunnyvale, Calif., productivity improvements and the general improved economy.

### \$50,000 Tax Benefit

United Data Centers' earnings reached \$144,076, or 10 cents a share, compared with a loss of \$214,071, or 15 cents a share, in the first quarter last year. The 1972 figure includes a \$50,000 extraordinary tax benefit. Revenues rose to \$2.2 million from \$1.9 million in the year-ago period. The 1971 loss, according to President Bernard Goldstein, was a result of the treatment as a

pooling of interest of the Dynafax, Inc. acquisition.

Keydata Corp.'s nine-month earnings before taxes and non-recurring income rose to \$96,000 compared with a loss of \$91,000 in the same 1971 period.

Revenues rose to \$5.4 million from \$4.4 million a year ago. Sterling Computer Systems, Inc. concluded the year ended March 31 with earnings of \$348,126, or 17 cents a share, compared with a netted \$173,991, or 8 cents a share, for 11 months ended March 31. Revenues also rose to \$2.8 million from \$2.2 million.

# The GAs DMS. For 18/30 users at the end of their rope.

If you're at the end of your rope with a throughput-bound IBM 1130, here's welcome news: General Automation's 18/30 Disk Monitor System directly replaces the 1130. With increased throughput, faster memory, 4th generation hardware, expandability, even real-time and communications capabilities. All this for less than you're paying for your 1130. It's a true price/performance bargain.

GA's 18/30 DMS operates directly with programs written for 1130 DM2. So all of your existing software and programming effort is left intact. Future programs are probably already waiting for you in our extensive library. And you'll probably get at least five times the throughput you are currently getting on your 1130. What's more, you'll be able to choose from our line of faster peripherals — like mag tapes, big disks, card readers, line printers and plotters. It all adds up to a system designed to suit your needs for years to come.

The 18/30's role as a superior, economical replacement for the 1130 is a field-proven fact. A General Automation representative will be glad to show you why dozens of customers have already switched to the 18/30 DMS, and what it can do for you. To find out, give him a call. We maintain offices with complete field service and technical support in principal cities in the United States and Europe. And we're growing by leaps and bounds.

For more information on the 18/30 Disk Monitor System, write us today. We'll also send you your very own length of rope and a book, "Knots and Splices." All very handy for people at the end of their rope.



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## Nicksels & Dimes

Reduced second-quarter earnings have forced Foxboro to revise downward its previous projections for a "successful" year. The economic "recovery is three to four months behind expectations," and "customers just aren't issuing the orders as fast as we anticipated," noted Chairman Ralph Heyden Jr.

\$\$\$

TEC, maker of display terminals and components, reported an increase in earnings of 423% to \$211,632 in the year ended April 30. Reductions in overhead costs were cited.

\$\$\$

Intel sold 68,000 shares of Xerox common for a sum in excess of \$10 million. Intel still holds 52,000 Xerox common shares of the original 121,000 shares received in the acquisition by Xerox of Diablo Systems.

\$\$\$

Telcel has postponed its annual meeting from July 18 to Sept. 7. "Delays in the delivery of proxy materials and annual reports to our shareholders make it appear quite evident that a quorum will not be present at the original meeting date," noted President S.J. Jettre.

\$\$\$

University Computing is now incorporated as a Delaware corporation.

\$\$\$

Deliveries of new equipment in the first quarter were higher than for the entire first half of 1971, according to Thomas L. Ringer, Computer Machinery president.

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# Computerworld Stock Trading Summary

All statistics  
compiled, computed  
and illustrated by  
TRADE&QUOTES, INC.  
Cambridge, Mass 02139

## Earnings Reports

GENERAL AUTOMATION Three Months Ended April 30			
1972	1971		
Shr Ekd	\$ 15	\$ 21	
Revenue	4,052,000	2,582,000	
Net Ekd	140,000	100,000	
Earnings	301,000	10,000	
9 Mo Shr	45,000	50,000	
Revenue	10,560,000	7,917,000	
Earnings	912,000	(60,000)	

TELEX Year Ended March 31			
1972	1971		
Shr Ekd	\$ 12	\$ 5.3	
Revenue	73,507,000	61,837,000	
Net Ekd	1,821,000	1,461,000	
Earnings	912,000	5,493,000	

ANALOG DEVICES Three Months Ended April 29			
1972	1971		
Shr Ekd	\$ 16	\$ 13	
Revenue	3,446,339	3,101,043	
Earnings	218,881	161,435	
9 Mo Shr	48,000	50,000	
Revenue	7,244,528	5,673,258	
Earnings	399,713	267,000	

COMPUTING & SOFTWARE Three Months Ended April 30			
1972	1971		
Shr Ekd	\$ 32	\$ 20	
Revenue	27,813,000	25,264,000	
Net Ekd	1,821,000	1,461,000	
Earnings	1,924,000	1,672,000	
6 Mo Shr	61	53	
Revenue	51,043,000	45,091,000	
Earnings	3,635,000	3,211,000	

ALPHA INDUSTRIES Year Ended March 31			
1972	1971		
Shr Ekd	\$ 6.04	\$ 5.97	
Revenue	4,807,215	2,972,553	
Net Ekd	120,137	9,718	
Earnings	47,523	958,989	
9 Mo Shr	17,238	16,945	

MANAGEMENT DATA Three Months Ended May 31			
1972	1971		
Shr Ekd	\$ 12	\$ 13	
Revenue	1,952,300	2,342,000	
Earnings	155,000	140,000	

COMPUTER INSTALLATIONS Three Months Ended March 31			
1972	1971		
Shr Ekd	\$ 13	\$ 11	
Revenue	440,474	424,198	
Earnings	99,621	89,329	

TAB PRODUCTS Year Ended May 31			
1972	1971		
Shr Ekd	\$ 2.5	\$ 3.30	
Revenue	18,997,000	17,461,000	
Earnings	699,000	314,000	

DATA GENERAL Three Months Ended June 3			
1972	1971		
Shr Ekd	\$ 12	\$ 10	
Revenue	7,323,000	3,964,000	
Earnings	326,000	119,000	
9 Mo Shr	31	42	
Revenue	18,942,000	9,976,000	
Earnings	2,400,000	943,000	

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### CLOSING PRICES THURSDAY, JULY 20, 1972

	1972	CLOSE	WEEK	NET	PER	1971
		RANGE				
SOFTWARE & EDP SERVICES						
A ADVANCED COMP TECH	1-2	5 1/4	+ 1/4	+16.5		
A APPLIED DATA RES.	4-7	5 1/8	+ 1/2	+10.8		
N AUTOMATIC DATA PROC	72-94	93 5/8	+ 1 1/8	+1.2		
O BRANIFF APPLIED SYST	1-2	1 1/4	+ 1/8	+11.1		
O COMPUTER DIMENSIONS	1-2	1 1/4				
O COMPUTER SYSTEMS	1-4	1 1/4				
O COMPUTER NETWORK	4-7	5				
N COMPUTER SCIENCES	6-10	8 1/2	- 1/8	-1.8		
O COMPUTER TECHNOLOGY	6-8	5 1/2				
O COMPUTER USAGE	9-14	9 3/4				
O COMP AUTOMAT REPORTS	5-9	4 1/4	- 1/2	-5.5		
N COMPUTING & SOFTWARE	16-21	16 1/4	- 1/2	-8.4		
N COMSESS	1-5	5 1/2	- 3/4	-14.2		
O COMSHARE	5-10	8 1/2	- 1/2	-7.2		
O DATATAS	5-8	5 1/2	- 1/2	-8.3		
O EDP RESOURCES	5-8	2 1/8	- 1/2	-8.8		
A ELECT COMP PROG	2-5	5 2/8				
N ELECTRONIC DATA SYS.	13-65	52 5/8	+ 5/8	+5.2		
O INFORMATICS	5-11	6 5/8				
I I.O.A. DATA CORP	1-3	2 1/2				
A ITEL	8-12	7 3/4	- 3/4	-8.8		
O KEANE ASSOCIATES	4-7	4 1/4				
O KEYDATA CORP	7-13	12 1/4	- 3/4	-3.7		
O LOGICON	4-7	6				
A MANAGEMENT DATA	4-10	7				
O NATIONAL CSS INC	8-25	18 7/8	- 5/8	-5.2		
P ON LINE SYSTEMS INC	8-20	18 1/2	+ 7/8	+4.9		
N PLANNING RESEARCH	10-17	10	- 1/2	-6.7		
O PROGRAMMING METHODS	20-24	20 3/4	+ 1/4	+1.2		
O PROGRAMMING SYS	3-5	1 1/4	- 1/8	-5.5		
O SCIENTIFIC COMPUTERS	3-4	2 1/2				
O SIMPLICITY COMPUTER	1-5	5 1/8	- 1/8	-5.8		
O TOS COMPUTERS CENTERS	2-5	5 1/4	+ 1/4	+16.6		
O TRACOR COMPUTING	2-5	5 1/4				
O TYMSHARE INC	7-10	7 7/8	+ 1/8	+1.6		
O UNITED DATA CENTER	10-16	17 3/4	- 1/4	-1.3		
N UNIVERSITY COMPUTING	18-26	17 3/4	- 1/4	-1.3		
A US SYSTEMS	8-19	8				
O VORTIC CORP	2-5	5 1/2	- 3/4	-11.1		
PERIPHERALS & SUBSYSTEMS						
N ADDRESSOGRAPH-MULT	34-47	44 1/2	+ 3/4	+1.7		
N ADVANCED HIGHWAY SYS	12-13	13 1/4	- 1/4	-0.9		
N AMPEX CORP	7-15	7 3/8	+ 1/4	+3.5		
O ANDERSON JACKSON	5-11	7 1/8	+ 1/8	+1.8		
O ATLANTIC TECHNOLOGY	5-11	7 1/8				
A GALT, SERANKE & NEW	5-21	17 5/8	- 1/8	-1.3		
N GUNTER-HARD	9-18	15 3/4	- 1/4	-1.8		
A HOLCOMB	17-25	17 3/8	- 3/8	-2.1		
O CENTRONICS DATA CORP	11-15	16 1/2	- 1/2	-1.7		
O COMTECHNICS	5-11	5 1/4	- 1/2	-11.7		
O COMPUTER COMMUN.	2-7	7 3/8	+ 1/4	+2.0		
A COMPUTER EQUIPMENT	3-7	7 1/8	- 1/4	-1.8		
O COMPUTER MACHINERY	7-15	10	- 7/8	-8.0		
A COMPUTER	5-9	4 7/8				
A DATA PRODUCTS CORP	4-7	4 1/4	- 3/8	-11.1		
O DATA RECOGNITION	5-11	5 1/4	- 1/2	-11.2		
O DATA TECHNOLOGY	5-11	5 1/4	- 1/2	-11.2		
O DIJAN CONTROLS	5-11	5 1/4	- 1/2	-11.2		
O ELECTRONICS	5-11	5 1/4	- 1/2	-11.2		
N ELECTRONIC M & M	5-8	5 1/4	- 1/2	-11.2		
O FAIR-TEX	5-8	5 1/4	- 1/2	-11.2		
O GENERAL COMPUTER SYS	7-16	13 3/4	- 1/4	-1.9		
N GENERAL ELECTRIC	50-70	62 5/8	- 1/4	-1.9		
N HALLINER CORP	28-47	47 1/2	- 1/2	-1.9		
O INFOTEK INC	28-47	47 1/2	- 1/2	-1.9		
O INFORMATION DISPLAYS	2-7	7 1/4	- 1/4	-1.9		
A LUNDY ELECTRONICS	3-7	7 1/4	- 1/4	-1.9		
O MANAGEMENT ASSIST	1-2	2 5/8				
N HENKENS	25-38	28 1/8	- 3/8	-1.5		
A HILOR ELECTRONICS	17-24	24 1/8	- 3/8	-1.5		
N HMD&M DATA SCI	18-27	27 1/8	- 3/8	-1.5		
O OPTICAL SCANNING	6-17	17 1/8	- 3/8	-1.5		
O PERTEC CORP	6-17	17 1/8	- 3/8	-1.5		
O PHOTON	15-21	21 1/8	- 3/8	-1.5		
A POTTER INSTRUMENT	17-21	21 1/8	- 3/8	-1.5		
O PRECISION INST.	7-15	15 1/2	- 1/2	-9.0		
O RECOGNITION EQUIP	4-13	13 1/8	- 1/8	-1.7		
N SANDERS ASSOCIATES	17-26	26 1/8	- 1/8	-1.7		
O SCAN DATA	17-26	26 1/8	- 1/8	-1.7		
O STORAGE TECHNOLOGY	17-26	26 1/8	- 1/8	-1.7		
O SYCOR INC	7-11	11 1/4	- 1/4	-10.2		
O TALLY CORP.	8-15	15				
N TEKTRONIX INC	34-60	57	- 3/8	-8.6		
O TELTEC	10-26	26 1/8	- 1/8	-8.0		
O WILTEK INC	10-26	26 1/8	- 1/8	-8.0		
SUPPLIES & ACCESSORIES						
O BALTIMORE BUS SUPPLIES	6-9	9	6 1/2	0.0		
A BARRY WRIGHT	5-9	13 3/8	+ 3/4	+2.3		
A DATA DOCUMENTS	17-26	26 3/8	+ 3/4	+2.3		
O DUPLEX PRODUCTS INC	8-16	16	- 7/8	-8.8		
N ENNIS BUS. FORMS	17-26	26 3/8	+ 3/4	+2.3		
O GRAMM MACHINETS	15-27	27				
O GRAPHIC CONTROLS	12-15	15	+ 1/4	+10.6		
N IM COMPANY	76-158	78 5/8	+ 1/2	+0.6		
O MOORE BUS. FORMS	48-96	96 5/8	+ 1/2	+0.6		
N MASHIMA CORP	37-77	77				
O REYNOLDS & REYNOLDS	34-70	70 1/4	+ 1/4	+12.0		
STANDARD REGISTER	34-70	70 1/4	+ 1/4	+12.0		

	1972	CLOSE	WEEK	NET	PER	1971
		RANGE				
TAB PRODUCTS CO						
N UARCO	14-17	15 1/4				
A WALSH MAGNETICS	13-24	22 3/4	- 1/4	-1.0		
N WALLACE BUS FORMS	8-11	8 1/2	- 1/2	-1.4		
	22-26	23 1/2	- 1/2	-2.0		
COMPUTER SYSTEMS						
N BURROUGHS CORP	147-195	191 3/4	+ 8 3/4	+4.7		
N COLLINS RADIO	34-50	35 3/4	- 3/4	-2.8		
O GRI COMPUTER CORP	35-51	49 1/4	- 3/4	-1.8		
O DATA GENERAL CORP	36-59	55	- 2 1/2	-5.5		
O DIGITAL CORP CONTROL	10-15	9 1/4	- 3/4	-7.1		
N DIGITAL EQUIPMENT	72-97	82 1/2	- 1/4	-2.1		
N ELECTRONIC ASSOC.	6-15	9 3/8	- 1	-8.0		
A ELECTRONIC ENGINEER.	24-31	28 1/4	- 1/4	-5.8		
N FEIGER	13-20	16 1/2	- 1/4	-1.8		
O GENERAL AUTOMATION	13-20	16 1/2	- 1/4	-1.8		
N HEMLETT-PACKARD CO	88-122	118 1/4	- 1 1/2	-2.1		
N HONEYWELL INC	130-138	130 3/4	+ 3/4	+5.5		
N IBM	333-404	390 3/4	- 1	-0.2		
O INTERDATA INC	8-16	10 3/4	- 1/4	-2.2		
O MICRODATA CORP	5-10	8 1/2	- 1 1/4	-12.8		
N MCR	35-47	35	- 1/4	-1.7		
N RATHGOWN CO	35-47	35	- 1/4	-1.7		
A SPERRY RAND	35-47	35	- 1/4	-1.7		
A SYSTEMS ENG. LABS	10-16	10 5/8	- 5/8	-5.3		
N VARIAN ASSOCIATES	14-18	15	+ 1	+1.1		
N VICTOR COMPOTER	15-24	18 5/8	- 1/4	-6.6		
N WANG LABS.	33-41	41 1/4	- 1/4	-2.8		
N XEROX CORP	121-159	151 1/4	+ 1/4	+2.8		

### LEASING COMPANIES

BOOTHIE COMPUTER	7-18	6 7/8	- 1/8	-1.7
O ORESHAMAN COMP.	2-5	2	- 1/8	-5.3
O COMSICO INC	3-18	15 1/2	- 2	-11.4
O COMPUTER EXCHANGE	2-5	5 1/4	- 1/4	-5.1
A COMPUTER INVESTS GRP	8-14	10	- 3/8	-5.8
N DATA CORP	3-13	3 3/4	- 1/4	-12.2
M DATACRUI RENTAL	3-6	6 3/4	- 1/4	-4.5
A OCL INC	3-10	5 3/4	- 1/4	-4.1
A OGDORSON-STORM	14-16	17 7/8	- 1 1/8	-7.1
A OPA, INC.	8-15	8 3/4		0
A GRANTHE MGR	7-11	11	- 3/8	0
A REYNOLDS COMPUTER	5-12	12 1/4	- 1/4	-1.6
N LEASCO CORP	17-24	24 3/8	+ 3/4	+10.0
O LASAPAC CORP	8-15	15 1/2		0
O LECTRO MFG INC	2-4	4 1/4	- 1/4	-9.0
O MCC INDUSTRIES	7-11	6 7/8	- 1/2	-6.7
A MCGRAW-HILL COMPUTER	3-7	5	- 3/4	-4.4
O SYSTEMS CAPITAL	1-10	10 1/2	- 1 1/2	-7.8
N U.S. LEASING	19-25	28 1/2	- 1/4	+2.1



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